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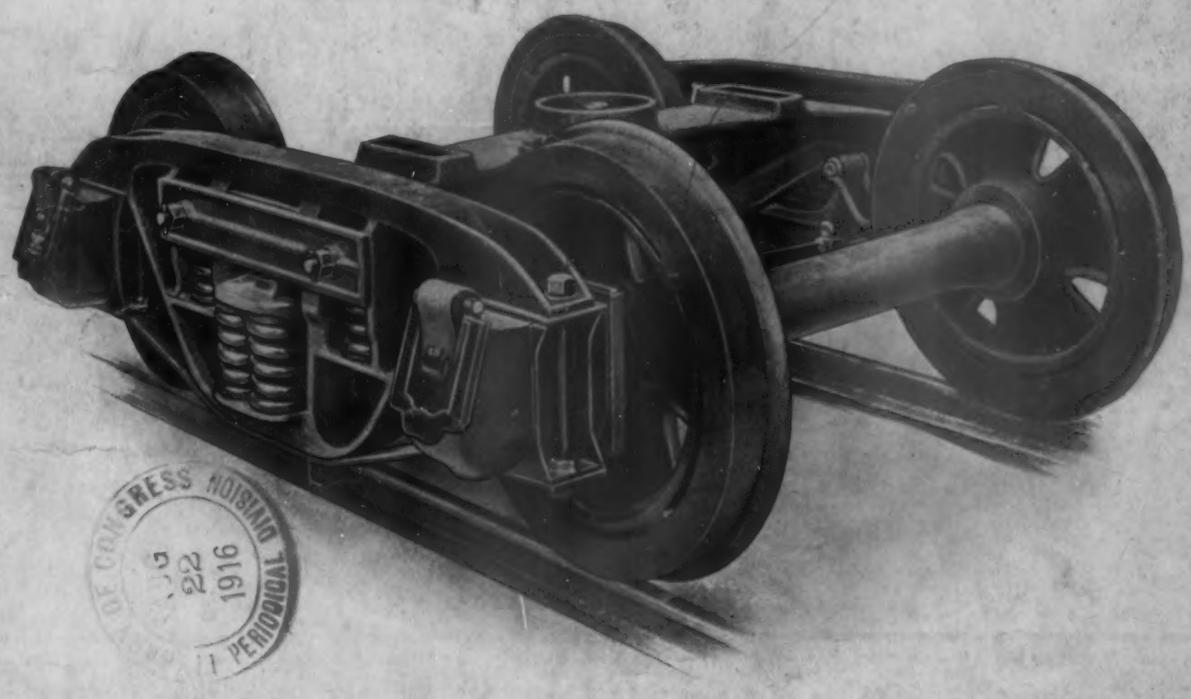

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"THE RAILWAY MECHANICAL MONTHLY"

(Including the Railway Age Gazette "Shop Edition.")

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Shop Kink Competition

When this paper reaches you there will be very little time left to complete and forward your contribution to the shop kink competition, which closes March 15, if you have not already done so. As stated in the previous announcements, a first prize of $50 will be awarded for the best collection of three kinks, while a second prize of $25 will be awarded for the next best collection. Kinks which are not awarded a prize but which are accepted for publication will be paid for at our regular space rates. If desired, more than three kinks may be submitted, in order that the judges may select and base their decision on what they consider to be the best three in the collection.

Reclaiming Scrap Material Competition

The first prize of $35 in the competition on reclaiming scrap material was awarded to Ernest Cordeal, bonus demonstrator of the Atchison, Topeka & Santa Fe, La Junta, Col., and the second prize was awarded to a contributor who signs himself "W. L. H.," but who, for various reasons, does not wish to have his name used. The articles are of a very different nature from those which were submitted in a similar competition last September. The important feature, which is more or less marked in all of them, is the tendency to provide means or make recommendations looking toward preventing material being consigned to the scrap bins which may be reclaimed or used again. In this way it will be possible to save the cost of handling the material to and from the scrap pile, which in many cases is a considerable item.

Grinding Car and Locomotive Axles

There are two very good reasons in favor of grinding the journals of car wheel axles —increasing of the life of the axle and the reduction in its tendency to heat when first put into service. The same feature of course also applies to driving axles. The advantages of this method have long been recognized by motive power men, but in the absence of a suitable machine for the work it has not been possible to follow it to any extent. This handicap, however, is now removed and as is shown elsewhere in this issue a grinding machine designed and built expressly for this purpose is being manufactured. A study of the arrangement of the machine indicates that the designers have made themselves thoroughly familiar with the requirements and have given the matters of rigidity in the machine and rapid handling of the product the attention they deserve.

Motive Power on the Chesapeake & Ohio

During the past two years the Chesapeake & Ohio has put into service three new classes of locomotives, each of which has given evidence of the most careful study of the conditions under which they are to be operated and of intelligent designing to deliver the required service with the greatest possible economy, not overlooking the desirability of a considerable reserve capacity. The first new type to be put into service was the Mallet for use in the mountain districts. These locomotives were of a straight-forward design, 2-6-6-2 type, and had a boiler with 24-ft. tubes and a combustion chamber 6 ft. 6 in. in length, but were not equipped with superheaters. The next new type was for passenger service in the mountains and is known as the Mountain type. These engines have superheaters, brick arches and mechanical stokers. The third new type, shown elsewhere in this issue, is a Mikado freight engine for low grade sections of the road and also has superheater brick arch and stoker.

The Mallet locomotives have now been in service about a year and a half and records covering eight months, which are available, show that they have produced a saving of 5.7 cents per thousand ton-miles in the cost of handling the traffic over

what it previously cost when using consolidations. Twenty-five of these engines were built by and 25 more have just been ordered from the American Locomotive Company, who designed all of the new types, working in conjunction with the railway officials. Superheaters and brick arches have been specified on the last order, clearly indicating that the service of these devices on the Mountain type and Mikado locomotives has been thoroughly satisfactory. The action of this road in regard to motive power forms probably the most striking example of a tendency, now becoming quite evident throughout the country, of designing motive power to obtain the greatest reduction in operating costs not only by the application of approved fuel saving devices but also from the elimination of double heading, pusher service and by the operation of fewer and heavier trains with locomotives which are designed with a thorough understanding of all the local conditions.

A Splendid Shop Kink Contribution

From time to time in making our shop kink competition announcements we have emphasized the importance of having the descriptions as clear cut and complete as possible. The great difficulty has been that the authors assume that the editors and readers are thoroughly familiar with the equipment and the shop conditions where the work is done and as a result they very often leave out information concerning the most important details; this entails a considerable expenditure of energy on the part of the editors in digging out the information required and doubtless often affects the efficiency of the article when it appears in print. One of the best prepared collections which has ever been received at this office appears elsewhere in this issue and was prepared by Louis D. Freeman, special tool designer of the Baltimore & Ohio. We trust that prospective contributors will look it over carefully and try to emulate Mr. Freeman in making their contributions clear cut, complete and forceful.

Shop Practice Competition

Elsewhere in this issue Mr. Le Compte of the Mt. Clare shops of the Baltimore & Ohio gives in outline his idea of the proper method of finishing driving boxes. His method is a good one but the question arises as to whether it is the best one, and for the purpose of satisfying ourselves on this point we propose to offer a prize of $25 to the person submitting an article descriptive of what is judged to be the best method of doing the driving box job complete. For the purpose of judging fairly it will be necessary to give more information than is given by Mr. Le Compte and we will require a detailed description of the different steps together with the time required for each one, the kind and size of machine used in each case, the amount of metal removed, and, in fact, all information of a like character necessary to permit the judges to come to a fair decision. This competition will close on May first, allowing nearly sixty days to prepare the material. Furnish sketches or photographs, if possible, wherever they will make the descriptive matter more clear. Articles which do not win the prize, but are accepted for publication, will be paid for at our regular space rates.

Burning Lignite Coal in Locomotives

Efforts to burn lignite in locomotives of the railways operating through districts where this fuel is procurable at a very low price, and good coal is very expensive, have been made with some degree of success for many years. In some sections the nature of the country is such that there is very little danger of the fire thrown from the locomotive stack doing any damage and under those conditions lignite has been used very successfully. At other points, however, live sparks from the stack cannot be permitted, and up to a comparatively recent date it has seemed impossible to use this fuel in these districts. The American Locomotive Company, working in connection with the Chicago & North Western, has finally evolved a spark arrester, which bids fair to allow lignite to be burned under any conditions. The result is obtained by an apparatus and front end arrangement which holds the live sparks and continually baffles them until they are ground to a fine powder and completely extinguished. It includes an arrangement, termed a gyrus, which gives the sparks a rapid circular motion in a horizontal plane within a cage made up of cast iron vanes so that the centrifugal force which tends to throw them outward causes them to be beaten against the edges of the vanes until they are completely ground up. They are then caught in the outgoing exhaust and the front end is kept clear. The success of this device is good news to the roads operating in the lignite districts.

Improvements in Locomotive Tenders

Coal which rolls off the tender onto the right of way virtually costs the railway company twice as much as that which is put into the firebox. In some cases it may cost a great deal more due to its convenience for trespassers to start a fire near the track; there have been cases, as well, where serious personal injury has been caused to passengers on station platforms by coal falling from the tender. Altogether it would seem that the trouble is of sufficient importance to warrant more effort to prevent it than is generally shown. For many years the tenders on the Chicago, Burlington & Quincy have been so constructed as to largely prevent coal being lost. The method consists simply in continuing the side plates at the coal space upward and inward over the fuel space for a distance of about 24 in. By this arrangement coal, which does not become dislodged at the chutes, will not become loosened thereafter. In some few instances other roads are using the same or similar construction and there would seem to be no reason why this or some other method should not come into general use. When the fuel supply is low in tenders of large capacity, in most cases it is some distance between the coal pile and the fire door, requiring considerable extra labor by the fireman at the time when he is least able to stand it. In some tender designs it is even necessary to climb up and shovel it down from the top as the coal supply is reduced. With the present locomotives burning coal at a rate practically taxing the fireman to the maximum of physical endurance, anything which will avoid unnecessary labor on the fireman's part should be looked upon with favor and some recent tenders have been equipped with a device arranged to force all of the coal into a position where it can be reached by the fireman without any extra labor. A device of this kind would seem to be most desirable on the larger locomotives that are worked to their capacity for the full length of the division.

Steel Car Center Sill Design

Theoretical treatises on car design are usually so complicated that the average reader, or even the mechanical engineer, finds it difficult to comprehend and apply them. Mr. Heffelfinger's study of the design of fish-belly center girders for cars, which appears on another page of this issue, is refreshing because of its practical nature and the ease with which his methods may be followed and applied by others. The tendency in recent years has been more and more toward graphical methods for the solution of problems of this nature and the advantages of this method can readily be comprehended in this case.

It is unfortunate that the other parts of the car, including the superstructure, are not as susceptible of theoretical treatment as are the center sills. Even in the case of the latter it is necessary to make certain arbitrary assumptions as to that part of the load on the sills due to the end shocks, but in the case of other framing members in the superstructure most of the stresses, if they are calculated, must be based entirely upon assumptions. That these are sometimes wide of the mark, or that proper provision has not been made for them, is indicated by the behavior of many

cars in actual service. Leaky roofs, defective ends, poor draft attachments, unsatisfactory side door arrangements, and other similar defects are present in a large proportion of the house cars.

Often these defects may be traced directly to a lack of knowledge on the part of the designer as to the failure in service of the cars in these respects. As more and more attention is directed to these points the engineers in charge of car design will undoubtedly come to some agreement as to the standard basis or requirements which the car should be designed to meet. That this has not come about sooner is due undoubtedly in some degree to the fact that the capacity and size of the cars has grown so rapidly in the past decade and that there has been an even greater development in increased tractive effort of the locomotive in the same time.

Solid Steel Engine Truck and Car Wheels

With the steadily increasing use of solid steel wheels in freight equipment, the necessity of standardizing the designs is becoming constantly more pressing. Committees of the Master Car Builders' Association and the wheel manufacturers are at work on the subject and it is probable that their report at the next convention of the Master Car Builders' Association will so present the subject that it can be fully settled in the comparatively near future. As an indication of the features which are liable to be the subjects of the greatest discussion, a paper by Charles G. Bacon, Jr., presented at the meeting of the Western Railway Club, was enlightening, and gave an opportunity for a preliminary skirmish that may greatly shorten the discussion at Atlantic City. Mr. Bacon favored a 2½-in. rim because his observations of wheels in service had indicated that the better material which it is possible to obtain with this thickness on account of the more thorough working which it can be given in the process of manufacture actually gave a longer life and more satisfactory service than a rim 3-in. thick. There was some disagreement with this view. If the 3-in. rim cannot be used because it is not possible to thoroughly work the metal with the present machinery, the natural inquiry would be as to the possibility of improving the machinery so that this thickness could be suitably worked. Thirty-three and one-third per cent. increase in the thickness of the wearing surface is well worth making strenuous efforts to obtain, and while no one wants a wheel which will give less mileage on a 2-in. wear than another will for 1½-in. wear, everyone desires a wheel which will give one-third more mileage before it has to be scrapped, and if Mr. Bacon's contentions are correct, it would seem to be up to the wheel makers to make improvements and furnish a wheel with a 3-in. rim with as good metal straight through as is now obtained in the 2½-in. rim. Mr. Bacon's other recommendations that a standard diameter of the inside face of the hub and a standard hub wall thickness be adopted seemed to meet with general approval.

Facilities for Repairing Steel Cars

When steel freight cars were first introduced, car department officials expressed considerable anxiety as to how they should go about to provide facilities for maintaining and repairing them. It was soon found, however, that the problem was not nearly as troublesome as it first appeared. Very little new equipment was required and most of it was comparatively simple and crude. Gradually, as the number of cars in service has increased, more and more refinements have been added, although these in most cases have proved neither extensive nor expensive. The Pittsburgh & Lake Erie, one of the first roads to introduce steel freight cars, made more or less elaborate provision for handling the work by the erection of a steel frame brick steel car repair shop at McKees' Rocks, Pa., but outside of the overhead cranes for handling the cars and a steel frame repair jack for restoring the cars and their parts to the proper shape when they became distorted, only a few other tools were provided, including the necessary furnaces for heating the damaged parts.

The Pennsylvania Railroad has a large steel car shop at Altoona but ordinarily it is used largely for building new equipment and only the heaviest repairs to steel freight cars are made in it. One of the most interesting practices at that shop is the provision of crane service for turning the bodies of hopper and gondola cars upside down for making certain classes of repairs, which it is difficult to handle when the bodies are in their normal position. The article by Louis D. Freeman, of the Baltimore & Ohio, on steel car repair kinks, which appears elsewhere in this issue, is of special interest because it clearly describes three devices which have been developed for handling steel car repair work and which are somewhat more pretentious than similar devices which are used for the same purpose on other roads. The Baltimore & Ohio has had a long experience in the maintenance and repair of steel cars and the devices for this work have been gradually developed as the work has grown more and more extensive.

Smoke Abatement on Switch Engines

Bulletin No. 6, issued by the Committee on Smoke Abatement and Electrification of Railway Terminals in Chicago, contains some interesting data procured from a test of a Santa Fe switch engine in the Eighteenth Street yards, Chicago. The object of the test was to obtain an exact record of the smoke issuing from a switch engine in regular switching service and to determine the total amount and size of the cinders thrown out by switching locomotives. The locomotive selected was a six-wheel switcher with 20-in. x 26-in. cylinders, 51 in. drivers and a grate area of 29.2 sq. ft. It was provided with steam jets passing through 2-in. ferrules in the side of the firebox and tests were made with both Pocahontas and Illinois coal. A special device for collecting a certain definite proportion of the cinders was devised and applied and the total amount discharged was computed on the basis of those caught in it. Smoke density was measured on the basis of the Ringelmann chart and in addition to this two other terms were used,—"white" meaning the absence of any color to the exhaust at the time of observation, and "clear" when neither smoke nor exhaust could be seen, nothing but a colorless heat vapor being driven off.

A full day's run burning Pocahontas coal having over 74 per cent. fixed carbon, 17.1 per cent. volatile matter and a heating value of 14,085 B. t. u., showed the following results:— "Clear," 42 per cent. of the time; "white," 34 per cent. and any grade of smoke 24 per cent. There was no smoke above the grade of No. 4 observed during the test and the average duration of smoke was from 3 to 8 seconds. A day's service with Illinois coal, which had about 61 per cent. fixed carbon, nearly 31 per cent. volatile matter and a heating value of 13,331 B. t. u., showed "clear," 2 per cent.; "white," 18 per cent. and "smoke," 80 per cent. During this day's test the maximum grade of smoke observed was No. 4. The duration of the smoking periods was considerably greater than with the Pocahontas coal and the average density of the smoke was considerably higher. The steam jets in the firebox were used quite frequently during this day's test, but were not used at all with the Pocahontas coal. The coal consumption with the Pocahontas coal was 386 lbs. per hour and with Illinois 457 lbs. per hour, the rate of evaporation with the former being 9 lbs. of water per lb. of coal and with the latter 7.6 lbs. of water per lb. of coal.

With the Pocahontas coal it is estimated that 3.17 lbs. of cinders were thrown from the stack per hour, while with the Illinois it amounted to 3.46 lbs. per hour. This is at the rate of .82 of one per cent. for the former and .76 of one per cent. for the latter. The cinders discharged with the Pocahontas coal had a heating value of 4,362 B. t. u. and those with the Illinois coal 6,103 B. t. u. The analysis of the smokebox gases showed

no poisonous gases or carbon monoxide present at any time for either of the coals. It is quite evident from this test that the better grade of coal gave a decided reduction in the total amount of smoke as well as an increase in evaporation, and although this coal costs 75 per cent. more than Illinois coal in Chicago, it is being very largely used on the switch engines of the Santa Fe. It is stated in the report that the most important apparatus applied to the locomotive for the reduction of smoke was the brick arch because it aids in maintaining uniformity of temperature of the firebox.

Mechanical Department Organization

As the roads have grown in size and the power and the capacity of the locomotives and cars have been increased the art of maintaining and repairing the motive power and rolling stock has grown to be a serious and complicated problem. As attention has become focused on the efficiency of the mechanical department it has become more and more evident that the best results could only be obtained by increasing the supervision and directing it more intelligently. Among the roads that have recently made radical and important developments in this direction is the Illinois Central. M. K. Barnum, who was appointed general superintendent of motive power of that road in April, 1910, has had a training which fitted him well for developing more efficient methods on that system, where they were so badly needed.

In carrying out his plans for greater efficiency, which have already resulted in remarkable results, he kept three things in view; first, that greater efficiency could be obtained by increasing the supervision; second, by eliminating all unnecessary work which would not in any way interfere with the successful operation of the equipment, and third, by the introduction of modern machinery and shop equipment. Really the last two of these depend more or less upon the first one. The present organization of the mechanical department is fully outlined in an article in another part of this issue and it is quite probable that further improvements will be made in the near future, all tending, however, toward better supervision.

A large saving was also made by cutting out unnecessary work, such, for instance, as stopping the practice of painting cabooses a bright vermillion when it would be impossible to distinguish them from the freight cars within a few months. A saving of $25,000 a year resulted from relining journal brasses instead of selling them for scrap. The repainting of freight car trucks when passing through the shop for repairs was discontinued because a careful investigation showed that it was useless. A department was inaugurated for reclaiming scrap and second hand material. The above are only a few of the many changes which have been made along similar lines. Extensive improvements are now being planned for the shop power plants and without doubt the standard of the machinery and other shop equipment will be raised and improved as fast as conditions permit.

NEW BOOKS

Early Motive Power of the Baltimore & Ohio. By J. Snowden Bell. 154 pages, 6 in. x 9 in. Cloth. Illustrated. Published by the Angus Sinclair Company, 114 Liberty street, New York. Price $2.

To anyone interested in locomotives, a study of their development and an examination of the drawings showing the construction of the early types has an attraction which to a large extent will be satisfied by this book. While it is confined to locomotives on the Baltimore & Ohio, the fact that this road was a pioneer in this country and exerted a very large influence on the early development of the locomotive, makes it of general interest. American locomotive development is probably more clearly portrayed by the various constructions on the Baltimore & Ohio than on any other road. The author makes no claim that the book is complete since many of the early records have been lost or destroyed, but it is probably more complete than anything of its kind that has previously been published. It is made up quite largely of a compilation from original papers and contains many photographs and drawings collected from various sources. The typographical work has been given careful attention, and results, particularly of illustrations, made from poor photographs, are very satisfactory. In addition to the historic locomotives there is also a chapter on the present power on the Baltimore & Ohio, briefly showing the latest designs. A chapter is also devoted to the biography of the early motive power officials of this company.

Maximum Production in Machine Shop and Foundry. By C. E. Knoeppel. 5 in. x 7½ in. Cloth. 365 pages. Illustrated. Published by the *Engineering Magazine*, 140 Nassau street, New York. Price, $2.50.

The title of this book clearly indicates its scope and object and while, of course, the complete discussion of everything that enters into maximum production could not be incorporated in one volume, the important factors have been very carefully covered. The author has based his whole discussion on personal experience, and, as a consequence, speaks most convincingly. He groups the machine shop and foundry in his discussion, stating that their work is so closely related that the problems can best be studied in this way. It appears that the foundry is given closer attention, largely because it has previously received less and offers greater opportunity for improvement. The work is divided into 16 chapters, starting with cost accounting, its importance and the best methods, and following through organization, systematic processes, deliveries, despatching and shop details. It briefly discusses the principles and the application in each case.

Efficiency as a Basis for Operation and Wages. By Harrington Emerson. Third edition revised and enlarged. 254 pages. 5 in. x 7½ in. Cloth. Published by the *Engineering Magazine*, 140 Nassau street, New York. Price, $2.

A series of articles by Harrington Emerson, which completely demonstrated and explained his development of the efficiency system, appeared in the *Engineering Magazine* from July, 1908, to March, 1909. It was soon discovered that it would be necessary to incorporate them into book form in order to supply the demands, and in 1909 the first edition of this work was published. It has very quickly gone through two editions, and it was decided before bringing out this, the third edition, that it would be advisable to make a thorough revision of the text in view of the knowledge and experience gained during the past two years. This has been done, and in addition to more clearly illustrating certain points and adding sections, points of connection between this volume and the one shortly to follow on the twelve principles of efficiency have been established. The book inclines more to the declaration of philosophy than to direct instruction in methods.

Technology and Industrial Efficiency. Published by the McGraw-Hill Book Company, New York. 6 in. x 9¼ in. 486 pages. Bound in cloth. Price, $3.00.

This volume contains the proceedings of the Congress of Technology, held in Boston, Mass., last April at the Massachusetts Institute of Technology. Some seventy papers are included which form a valuable and up-to-date record of the present state of industrial science, including the presentation of some of its problems and probable solutions. The six sections into which the congress was divided are represented by papers on: Scientific Investigation and Control of Industrial Processes, Technological Education and Its Relation to Industrial Development, Administration and Management, Recent Industrial Development, Public Health and Sanitation, and Architecture. These divisions are logical and comprehensive.

FISH-BELLY CENTER GIRDERS FOR CARS

A Practical Method for Determining the Length of the Cover Plate and the Flange Angles. Also a Semi-Graphic Method for Finding the Deflection at Any Point Along the Beam

BY ARTHUR E. HEFFELFINGER

The problem is to determine the elastic deflection at any point along a beam with overhanging ends and with a varying moment of inertia along the axis of the beam between span, due to the change in depth and the addition of cover plate and angles of less length than the span. For this problem the analytical solution of the equation of the elastic curve is complicated and quite laborious, requiring a refinement of calculation which costs more than it is worth, at least to the car business; anyhow, assuming a knowledge of fundamental mechanics, there is no

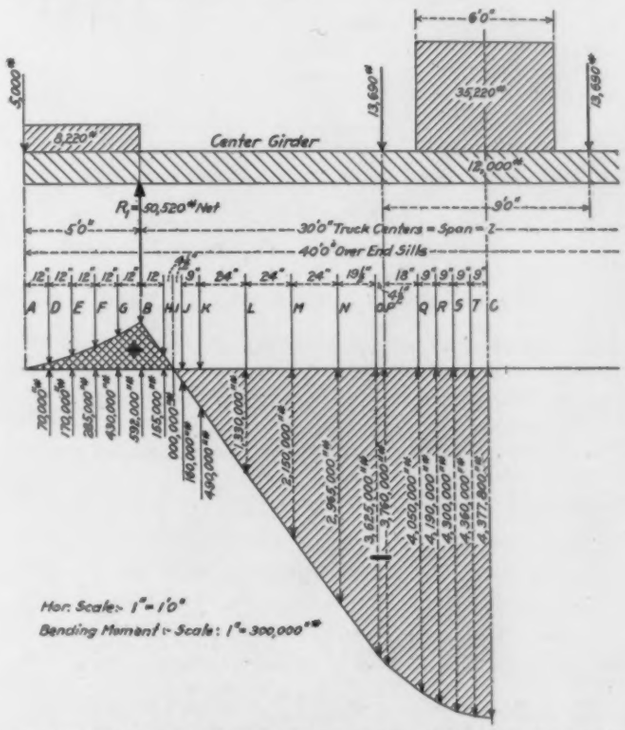


Fig. 1—Loading and Moment Diagrams for One-Half of the Center Girder Span.

earthly reason in the general assumption that a knowledge of the higher mathematics is absolutely necessary to the satisfactory solution of a great many of the problems in mechanics and the strength of materials usually treated by the methods of differential calculus. The aim of the paper, as in a previous one by the writer on the Double Open Diagonal Truss (*American Engineer & Railroad Journal*, November, 1909) will be to present practical matter only, regarding theory simply as a means to a practical end, and not as a field for the employment of mathematical research.

To make the problem typical, we will analyze the "fish-belly" center girder for a 40-ft., 80,000-lb. capacity gondola or flat car; since the loading is symmetrical about mid-span, only one-half of the loading and moment diagrams will be required, as shown in Fig. 1. The trucks are spaced 30 ft. apart, which will hereinafter be designated as the span, or l. The 13,690 lbs. between span concentrated loads comes over to the center girder through the cross-bearers, which are spaced 9 ft. apart. Because the bolster concentrations have no direct effect on the bending to be considered, they are ignored, leaving a net reaction equal to 50,520 lbs. at each support or center plate.

For subsequent notations:

M = Bending moment in inch lbs.
f = Allowable unit fiber stress = 13,500 lbs. per sq. in.
I = Moment of Inertia.
$\frac{I}{C}$ = Section Modulus.
E = Modulus of Elasticity = 29,000,000.

As changes in the sign in the bending moment diagram (Fig. 1) must be taken into account for the solution of deflection, the negative algebraic sign is attached to the bending moment which produces bending downward and the opposite sign to a bending moment producing bending upward.

As the loading is symmetrical about the mid-span, the point of maximum bending moment is at mid-span and equals 4,377,-800 inch lbs. The bending moment over the support is 592,000 inch lbs. and the point of inflection is at I, or about 16½ in. inside of the support. Lay off several ordinates along the beam, as through points D, E, F, G, H, etc., their location being arbi-

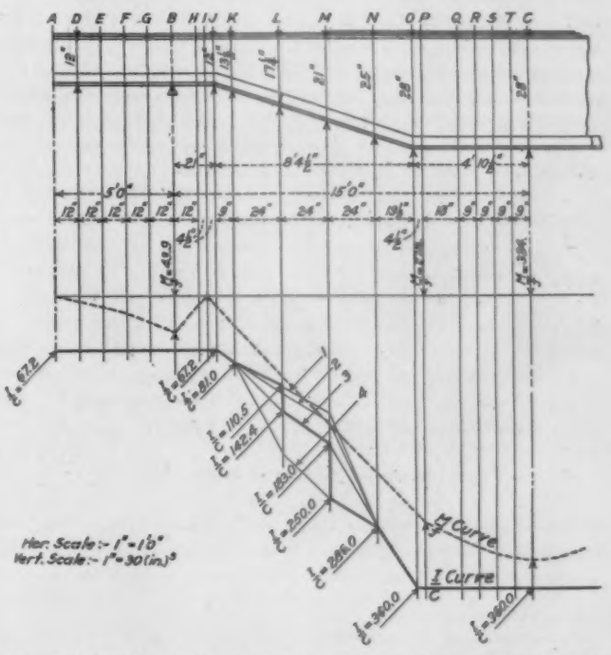


Fig. 2—General Design of Center Girders; Also Section Modulus and $\frac{M}{f}$ Curves.

trary, but not to be spaced more than 2 ft. apart, nor ranging over any sudden changes in the bending moment, particularly for that distance between span where the depth of the girder is variable. Of course, decreasing the distance between these verticals will give greater accuracy in the location of the theoretical points where reinforcements are to begin, but again, we are dealing with the practical everyday case.

Fig. 2 shows the design of the girder; note that the web, one

cover-plate and the outside bottom flange angles are continuous over the supports. The maximum section at the center is 28 in. deep, as shown in detail in Fig. 11, and continues a uniform section to a point 4½ in. beyond the centers of the cross-bearers, where it tapers up to a depth of 12 in., at a point 21 in. inside of the support, and then continues as a uniform section to end of the car.

In carrying this method into practice, it is recommended that Figs. 1, 2, 12 and 13 be plotted on one lay-out. This may be done very easily and nearly enough for all practical purposes with

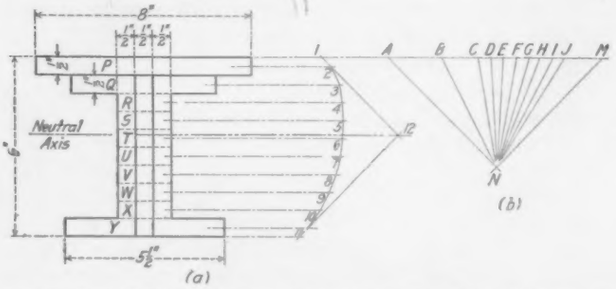


Fig. 3—Graphical Method for Determining the Neutral Axis and the Moment of Inertia of a Built-Up Section.

the scales as indicated on the illustrations, thereby saving unnecessary duplication; but to obtain a lucid exposition this cannot be done here; therefore the ordinates as located on the bending moment diagram are repeated in Figs. 2, 12 and 13. Compute the I and $\frac{I}{C}$ for sections at J, K, L, M, N and O, and in order to locate the vertical steps in the $\frac{I}{C}$ curve, compute the I and $\frac{I}{C}$ for the four possible combinations at each section; this if done numerically is quite laborious, but in plotting a considerable range of sections, any slight variation, plus or minus, will have a compensatory effect; therefore the graphical method as shown in Figs. 4 to 11 might be used to advantage. The following simple graphical method for determining the proper-

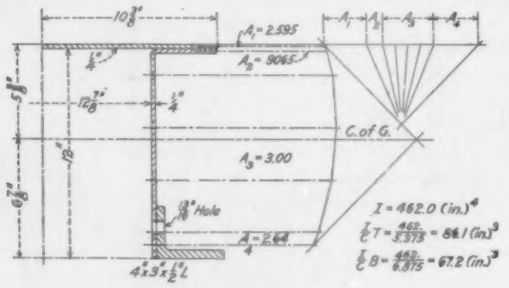


Fig. 4—Minimum Section of Center Girder.

ties of built-up sections is taken from the International Correspondence School's Building Trades Handbook.

"*Graphical Method.*—The location of the neutral axis and the moment of inertia of any section may be obtained by the following graphical method, which is sufficiently accurate for all practical purposes.

"*Example.*—Locate the neutral axis, and find the moment of inertia of the section shown at (*a*), Fig. 3.

"*Solution.*—First, draw the section, either full size or to any scale, as at (*a*).

"Second, divide this section by horizontal lines into strips of equal or unequal height; find the area in square inches and the center of gravity of each strip; since the strips in this case are rectangles, the centers of gravity will be at the centers of the strips, through which points dot and dash lines have been drawn.

"Third, on any horizontal line lay off, from left to right, to any scale, distances proportional to the area of the strips, taking them in order from top to bottom of the section. This horizontal line may be called the load or area line. Thus, at (*b*), the distances *AB*, *BC*, *CD*, etc., are measured to a scale of, say, 1/16 in. to 1 sq. in. area, and represent the areas of the sections *P*, *Q*, *R*, etc., respectively, in (*a*).

"Fourth, from the ends *A* and *M* of this line, draw lines inclined 45° to it, and intersecting at a point *N* called the pole. Draw lines from *N* to points *B*, *C*, *D*, etc.

"Fifth, commencing anywhere on a horizontal line through the top of the section, draw the line *1-2* parallel with the 45° line *AN*; from the intersection of this line with one through the center of gravity of slice *P*, draw *2-3* parallel to *BN*; from the intersection of *2-3* with the horizontal line passing through the center of gravity of slice *Q*, draw the line *3-4* parallel to *CN*. Continue in this manner, drawing the remaining lines *4-5*, *5-6*, etc., parallel, respectively, to *DN*, *EN*, etc.

"Sixth, draw, from the points *I* and *II* at the end of the curve, 45° lines intersecting at the point *12*, through which draw a horizontal line, cutting the section as shown at (*a*), Fig. 3; this line will be the neutral axis of the figure.

"Seventh, the moment of inertia, *I*, may be found by multiplying the area in square inches of the figure, *1*, *12*, *11*, *10*, *9*, *8*, etc., by the entire area of the section. Thus, if in this case the area of the former is 4.67 sq. in., and that of the section at (*a*) is 16.25 sq. in., the moment of inertia will be equal to 16.25 sq. in. × 4.67 sq. in. = 75.88, the value of *I* for this section."

Probably the quickest method for finding the area of this section-lined figure would be by the use of the planimeter,

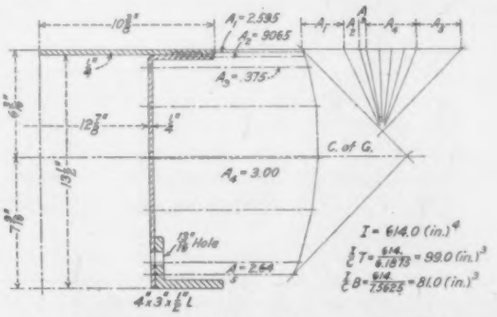


Fig. 5—Section of Center Girder at *K*, Fig. 2.

which should of course be set to the same scale as used in laying out the section at (*a*), Fig. 3. However, the common rule for finding the area of irregular figures might also be used, but in obtaining the dimensions necessary for determining the area, as with the planimeter, the same scale should be adopted as used in laying out the section.

The dotted curve in Fig. 2 is the $\frac{M}{f}$ curve plotted from the M curve, Fig. 1. The heavy line curve, Fig. 2, is the $\frac{I}{C}$, or section modulus, curve whose ordinates represent the $\frac{I}{C}$ of the various sections as found above, plotted to the same scale as the $\frac{M}{f}$ curve. The light line curves *1*, *2*, *3* and *4* represent plottings for the various combinations of sections; the first of these is the

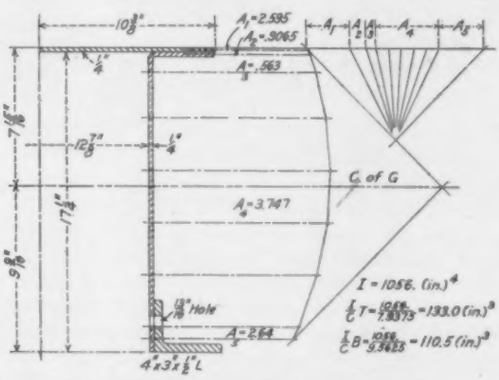


Fig. 6—Section at *L*, Corresponding to Curve 1, Fig. 2.

combination of a single cover-plate and single angles; the second, double cover-plate and single angles; the third, a single cover-plate and double angles; and the fourth, double cover-plates and double angles. The intersection of curves *2*, *3* and *4* with the vertical through *K* would fall below that shown, and likewise curves *1*, *2*, *3* would intersect ordinate *N* at points above that

shown; but, inasmuch as the added plate and angles will begin somewhere between these limits, the intersections as shown are good enough. These limits are typical for the average car of this type, the only condition being, that the $\frac{I}{C}$ curve be a reasonable amount below the $\frac{M}{f}$ curve, which, as shown, is about the usual practice.

Then, beginning at the minimum section which is 12 in. deep, Fig. 4, pass along the first curve to K where the section is 13½

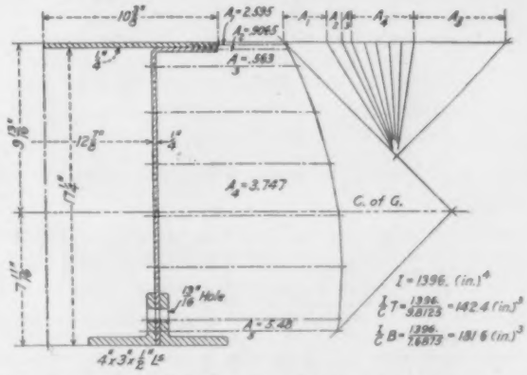


Fig. 7—Section at L, Corresponding to Curve 3, Fig. 2.

in. deep, Fig. 5. At this point curves *2*, *3* and *4* begin. It will be seen that we can continue along curve 1 to L, where the section is 17¼ in. deep, Fig. 6, with a margin of safety under the $\frac{M}{f}$ curve. Continuing further along this curve would cut into the $\frac{M}{f}$ curve, making it evident that some reinforcement will be necessary; and as curve *2* would still cut the $\frac{M}{f}$ curve, step down to curve *3*'s intersection with L, which is the section shown in Fig. 7, whose depth is still 17¼ in., but it has the added inside

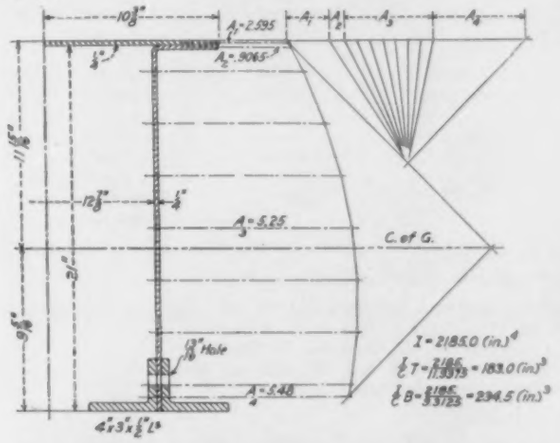


Fig. 8—Section at M, Corresponding to Curve 3, Fig. 2.

angle, which indicates that the inside bottom flange angles begin, theoretically, at this point. Then follow along curve *3* to M, where we come as close to the $\frac{M}{f}$ curve as we dare, with the section which is 21 in. deep, Fig. 8; the required additional reinforcement at this point is accomplished by stepping down to curve *4*, where the section is as shown in Fig. 9; this indicates that the first or top cover plate begins theoretically at this point. Continue along curve *4* to N where the section is 25 in. deep, Fig. 10, and thence to O where the section is 28 in. deep, Fig. 11. At this point the maximum section begins and continues a uniform section to the corresponding point on the opposite side of the mid-span. The $\frac{I}{C}$ curve is now complete; note that it keeps within a safe margin below the $\frac{M}{f}$ curve. It is very irregular because the girder for constructive reasons is only an approximation to the uniform strength, the vertical steps being caused by the sudden addition to the various sections.

In designating points where reinforcement begins as theoretical, it is understood that sufficient plate and angles must be added beyond these points to relieve the continuous portion of the flange area and assure the distribution of the stress.

DEFLECTION AT ANY POINT ALONG THE BEAM.

In investigating the deflection of beams of uniform section, or where E and I are constant, it will be apparent that the area of the bending moment diagram between two points on a beam is proportional to the difference in inclination between the tangents to the elastic curve at these two points; and from a point where

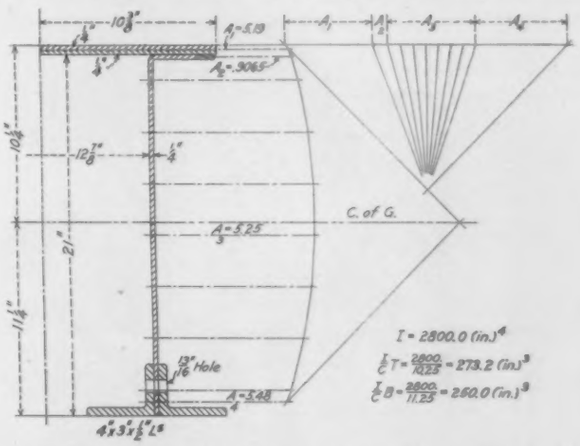


Fig. 9—Section at M, Corresponding to Curve 4, Fig. 2.

the tangent to the elastic curve is horizontal to any other point the area of the bending moment diagram between them is proportional to the actual inclination of the tangent at the second point; taking account, of course, of the signs of the areas. Or more generally expressed, the same kind of relation exists between the bending moment diagram and the elastic curve of deflection, as between a diagram of the load and the curve of moments.

Then taking the origin of moments at support distance l from

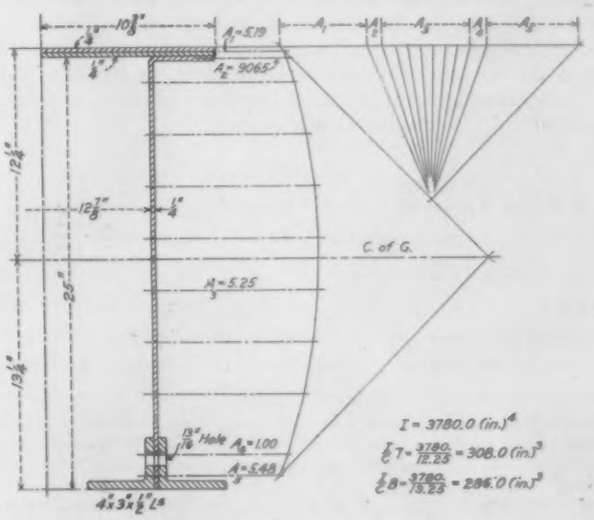


Fig. 10—Center Girder Section at N, Fig. 2.

B (Fig. 1), the inclination of the tangent to the elastic curve at B is:

$$\frac{A\ x_1}{E\ I\ l}$$

in which A is the total area of the bending moment diagram between span, and x_1 is the distance of its center of gravity from

the origin. And in a like manner, with the origin at B the inclination of the tangent to the elastic curve at support distance l from B is:

$$-\frac{A\,(l-x_1)}{E\,I\,l}$$

With the convention of signs as established A is negative for a beam carrying downward loads which produce bending downward, or which produce positive downward deflections; hence, inclinations downward to the right of support B are taken as positive, and likewise inclinations downward to left of the support opposite B are taken as negative.

With E and I still constant, the deflection at X or any point along the beam between span is (Inclination of tangent at $B \times x$) + (Moment about origin X of the area of the bending moment diagram between X and B, divided by EI). In which x is the distance point X is located to the right of B. The second term represents the perpendicular displacement of the beam at X from the tangent to the elastic curve at B, remembering that it is negative for loads producing bending downward, and positive for loads producing bending upward.

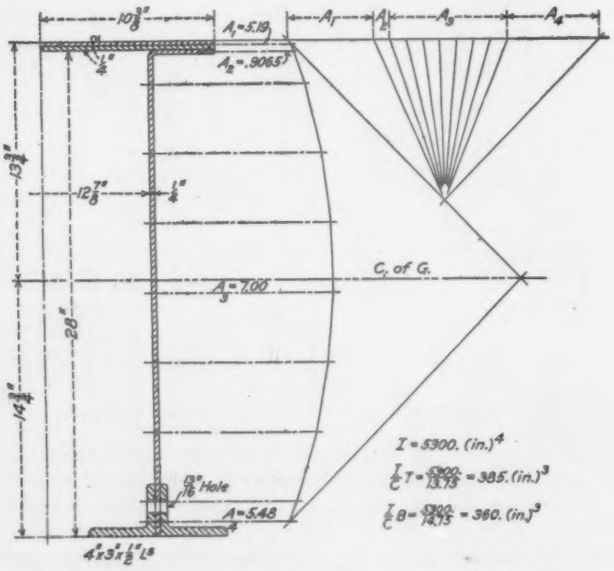


Fig. 11—Center Girder Section at *O*, Fig. 2.

APPLICATION.

The above is applicable to beams of variable section, or where E only is constant, by using the quantity $\frac{M}{I}$ instead of M throughout. This may be accomplished graphically by plotting, as in Fig. 12, values of $\frac{M}{I}$ at points A, B, C, D, E, F, G, H, etc., on the beam as a base line, thus producing the irregular curved $\frac{M}{I}$ diagram, whose area now supplants the bending moment diagram. The signs here are the same as for the bending moment diagram; also, only one-half of the $\frac{M}{I}$ diagram will be required (Fig. 12), as both loading and values of I are symmetrical about the center or mid-span; hence the point of maximum deflection is at the center and the deflections at corresponding points about the center are evidently the same.

The ordinates A, B, C, D, E, F, G, H, etc., serve to divide the irregular $\frac{M}{I}$ diagram into small parts or vertical strips, whose areas and the location of the center of gravity for each part is a simple computation. Fig. 12 shows the areas of these elementary parts of the $\frac{M}{I}$ diagram, and distances from mid-span to the center of gravity of each part for points between span, and from the free end of the cantilever for the overhang.

Considering the deflection at the points between span for the present, take origin X at C or mid-span and figuring from C to B, the summation of moments of areas about the origin C equals:

Area.	Distance from Origin X.	Moment.
— 7,416	4.50	— 33,372
— 7,353	13.48	— 99,118
— 7,209	22.47	— 161,986
— 6,993	31.46	— 219,910
— 13,266	44.87	— 595,245
— 3,141	56.24	— 176,650
— 14,352	68.48	— 982,825
— 18,648	89.93	—1,677,015
— 23,232	113.90	—2,646,125
— 24,696	137.13	—3,386,563
— 5,148	153.90	— 792,277
— 778.5	160.50	— 124,949
+ 756	166.50	+ 125,874
+ 9,696	175.17	+1,698,448
—121,780.5		—9,071,713

Inclination of tangent to the elastic curve at B is:

$\frac{Ax_1}{EI}=\frac{243{,}561\times 180}{29{,}000{,}000\times 360}$ = 14 min. 26 sec., or inclination downward to the right of B.

Deflection at X or any point along the beam between span is: (Inclination of tangent at $B \times x$) + (Moment about origin X of the area of the $\frac{M}{I}$ diagram between X and B, divided by E), remembering the function and signs of the second term as established above; also note that the tangent at B is a constant.

The shaded portions in Fig. 13 represent the second term. Referring to the above summation of moments of areas about C, we have for the second term:

$\frac{-9{,}071{,}713}{29{,}000{,}000}$ = —.313 in., or the perpendicular displacement of the beam at C from the tangent to the elastic curve at B.

For the first term of above formula, we have:

180 in. × tan. 14 min. 26 sec. = .756 in., or the positive downward deflection at C of the tangent to the elastic curve at B.

Then,

.756 in. + (—.313 in.) = .443 in. downward deflection of the beam at C, which is maximum for the case in point.

Origin X at P; summation of moments of areas about P for that portion of diagram between ordinates P and B is as follows:

Area.	Distance from Origin X.	Moment.
— 3,141	2.24	— 7,036
— 14,352	14.48	— 207,817
— 18,648	35.93	— 670,023
— 23,232	59.90	—1,391,597
— 24,696	83.13	—2,052,978
— 5,148	99.90	— 514,285
— 778.5	106.50	— 82,910
+ 756	112.50	+ 85,050
+ 9,696	121.17	+1,174,864
		—3,666,732

$\frac{-3{,}666{,}732}{29{,}000{,}000}$ = —.1264 in., perpendicular displacement of the beam at P from the tangent to the elastic curve at B.

Positive downward deflection at P of the tangent to the elastic curve at B, is:

126 in. × tan. 14 min. 26 sec. = .5291 in.

.5291 in. + (—.1264 in.) = .4027 in. downward deflection of the beam at P, or the cross bearer centers.

Then similarly:

Origin X at M; summation of moments of areas = —698,537.

$\frac{-698{,}537}{29{,}000{,}000}$ = —.0241 in.

78 in. × tan. 14 min. 26 sec. = .32755 in.

.32755 in. + (—.0241 in.) = .30345 in. downward deflection of beam at M, or the point where the cover plate begins.

Origin X at L; summation of moments of areas = 62,016.

$\frac{62{,}016}{29{,}000{,}000}$ = .00214 in.

54 in. × tan. 14 min. 26 sec. = .22676 in.

.22676 in. + .00214 in. = .2289 in. downward deflection of the beam at L, or the point where the inside angle begins.

It will be noticed, that here the second term of the formula has changed sign, this taking place at point W, where the second term would be zero; or taking origin X at W, the summation of moments of areas about W for that portion of the diagram between ordinates W and B is zero.

Origin X at J; summation of moments of areas = 161,286.

$\frac{161{,}286}{29{,}000{,}000}$ = .00556 in.

21 in. × tan. 14 min. 26 sec. = .08819 in.

.08819 in. + .00556 in. = .09375 in. downward deflection of the beam at J, or the point where the minimum section begins.

Origin X at I; summation of moments of areas = 115,420.

$$\frac{115,420}{29,000,000} = .00398 \text{ in.}$$

16½ in. × tan. 14 min. 26 sec. = .06929 in.

.06929 in. + .00398 in. = .07327 in. downward deflection of beam at I, the point of inflection; or the point where the bending downward changes to bending upward.

Origin X at H; summation of moments of areas = 69,520.

$$\frac{69,520}{29,000,000} = .00240 \text{ in.}$$

12 in. × tan. 14 min. 26 sec. = .05039 in.

.05039 in. + .00240 in. = .05279 in. downward deflection of beam at H.

The deflection at any point on the overhanging end may be determined as for a cantilever, provided the deflection due to the inclination of the tangent to the elastic curve at the support be added (algebraically). This is done by taking the origin at the point in question, and dividing by E, the summation of moments of areas of the $\frac{M}{I}$ diagram from origin up to the support. For convenience, the negative sign is attached to inclinations upward to the left of the support, and the positive sign to areas of the $\frac{M}{I}$ diagram which produce positive downward deflection to the left of the support.

Then, for deflection at the extreme end of the overhang, take the origin X at A where the summation of moments of areas about A is:

Area.	Distance from Origin X.	Moment.
13,248	54.30	719,366
9,264	42.40	392,794
5,904	30.50	180,072
3,120	18.83	58,750
912	8.00	7,296
		1,358,278

$$\frac{1,358,278}{29,000,000} = .047 \text{ in. perpendicular displacement of the beam at } A \text{ from the tangent to the elastic curve at } B.$$

Negative upward deflection at A of the tangent to the elastic curve at B is:

60 in. × tan. 14 min. 26 sec. = —.252 in.

—.252 in. + .047 in. = —.205 in. upward deflection of beam at A.

The problem as stated, assumed a uniform section from the support to the free end of the overhang. In this case, the common formulas (where E and I are constant) for cantilever deflections would have been sufficient, of course adding (algebraically) the deflection due to the inclination of the tangent to the elastic curve at support; but for applications of draft gear and splicing, the overhang is not usually a uniform section, therefore the same method was used for overhang as for points between span.

Fig. 13 shows the final deflection curve, greatly exaggerated, and

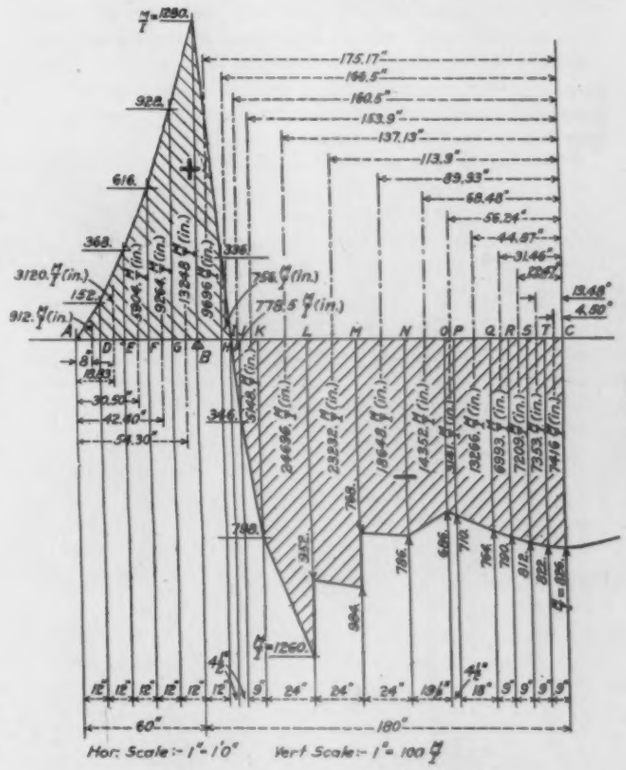


Fig. 12—$\frac{M}{I}$ Curve for Center Girder.

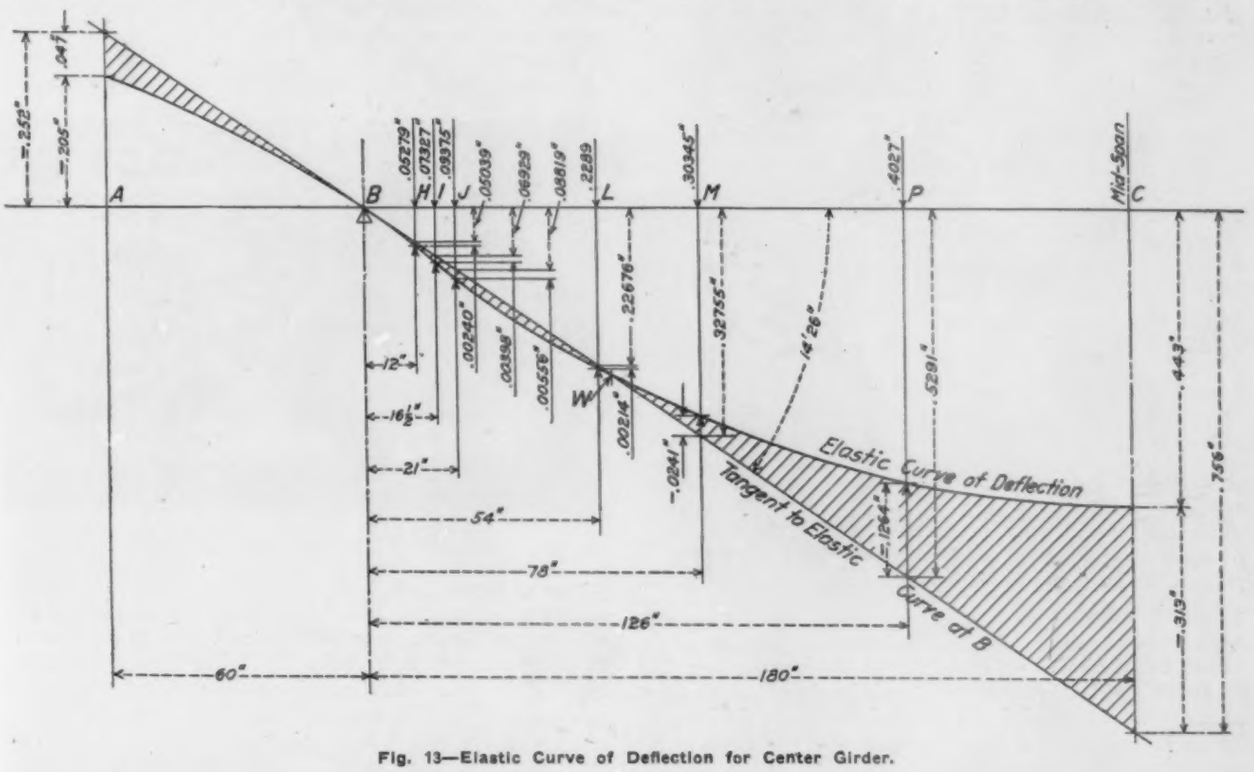


Fig. 13—Elastic Curve of Deflection for Center Girder.

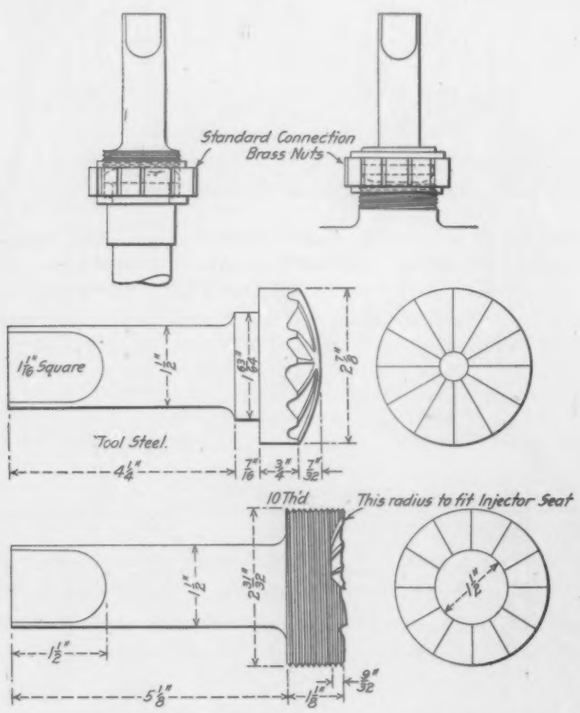
on which is indicated the constant tangent to the elastic curve at *B*. Having worked out the deflections for several points along the beam it is evident that the same method would solve for any point and is applicable to all girders or beams of this type, its value varying directly as the irregularity of loading and section. Usually only the maximum deflection is required, when it will be seen how short and very easy of application this treatment of the question is; therefore I believe it supplies a want which has long been felt by practical car men.

All of the above is based on the theory of simple bending only, and therefore takes no account of the deflection due to shearing, which, for all practical purposes is negligible anyhow, in comparison with that caused by the bending moment. Also, it is assumed that all deflections take place within the elastic limit, and are very small compared to the span.

REAMER FOR BALL JOINTS

BY CHARLES MARKEL.

A reamer is used for refacing the ball joints of injectors, boiler checks and connections, at the Clinton shops of the Chicago & North Western which is noticeably simple and convenient. The illustration shows the tools and also an arrangement whereby the standard nut is used for centering the reamer and for feeding it. All necessity for connecting



Reamers for Boiler Check Connection Joints.

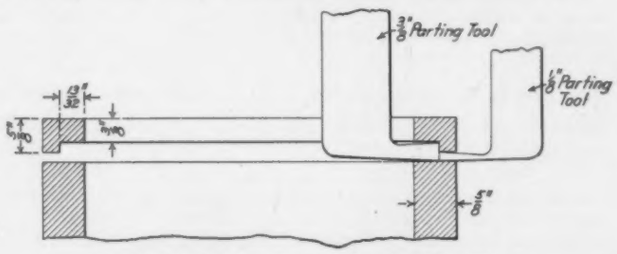
up a guide bar or feeding mechanism is entirely eliminated and in practice it is simply necessary to make a few turns of the reamer with a hand wrench to face off the seat. This, of course, can be done without taking down the piping or parts. These reamers are comparatively inexpensive and are valuable time savers.

Suez Canal Traffic.—The number of vessels passing through the Suez Canal last year was 4,969, and the receipts of the canal amounted to 134,010,000 francs ($26,802,000). The dredging of the canal to a depth of 35 ft. (4 ft. deeper than the former level) has been almost finished.

MACHINING PISTON VALVE PACKING RINGS

BY C. E. PADDACH.

The finishing of piston valve packing rings is accomplished by various methods, and one that has proved to be satisfactory is given herewith. The ring is held in a chuck, as shown in the illustration. The clamps have two set screws on the outside and one set screw in a projection on the inside, thus holding the ring without distortion due to eccentric clamping. Seven tools are used, three are held in the side turret head, and four in the vertical turret head. The side head contains a roughing

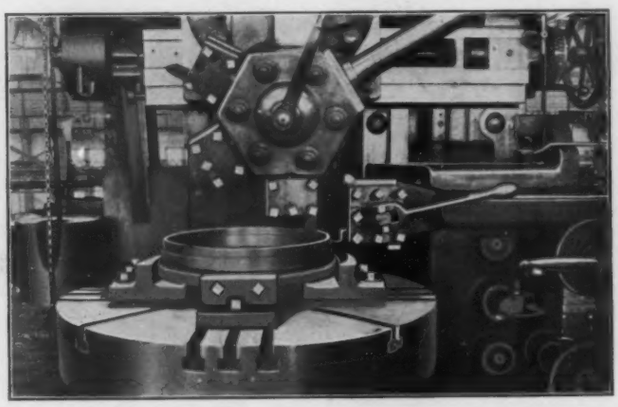


Parting Tools for Piston Valve Packing Ring.

tool, a finishing tool and a 1/8 in. parting tool. The vertical head contains a rough facing tool, a boring tool, a narrow facing tool and a 3/8 in. parting tool bent at an angle of 90 deg. The operations of roughing and finishing the ring are the same as in any of the other methods.

The interesting feature of this method is in cutting off the rings. After the top of the casting is faced with the narrow facing tool in the vertical tool head, the 3/8 in. inside parting tool is set 3/8 in. minus .002 in. lower than the finished top surface, as shown in the illustration. This allows for a good fit in the valve body. The 1/8 in. outside parting tool is then placed in position 5/8 in. below the top of the ring and is set back 3/16 in. from the casting. The power feeds for the two tools are thrown in simultaneously. This will give the required 13/32-in. niche in the bottom surface of the ring.

The cutting off may also be accomplished by allowing the inside parting tool to cut in 3/16 in. before the outside parting tool



Machining Piston Valve Rings.

is allowed to cut. The 3/8 in. parting tool on the inside is rigid enough to prevent any irregularity in the thickness of the ring, which is usually caused by hard and soft spots in the iron. As the two tools work at the same time, a considerable saving will result in the time taken for cutting off in addition to not having to change tools. The only rough edge that comes on the ring when using this method, is in a place where it does no harm, and no further finish is necessary.

THE CONSERVATION OF MATERIAL

Awarded the First Prize in the Competition on Reclaiming Scrap Material. The Methods Described Have Resulted in a Saving of about 30 Per Cent. in the Material Account in a Group of Divisions of One Railway.

BY ERNEST CORDEAL,

Bonus Demonstrator, Atchison, Topeka & Santa Fe, La Junta, Col.

Much has been and is being done along the line of reclaiming serviceable material from scrap piles, and it is not the intention to decry or belittle the results which have been thus accomplished. However, if materials must be economized, as they certainly must, and more at the present time than ever before, why should the reclamation not take place before the serviceable parts are consigned to the scrap bins instead of afterwards? The value of the material itself is of great importance; the expense of handling and rehandling, of sorting and resorting is of hardly less. The segregation of serviceable material from that which is properly scrap is an operation which should be conducted with intelligence and forethought; not blindly and indiscriminately. Parts may be, and sometimes are, reclaimed and repaired at a cost in excess of the price of new material, and any system devised for the purpose of economizing material should be supported by accurate cost records of manufacturing and repairing the parts, such as to render the determination of what articles warrant repairs and what do not a matter of certainty rather than of personal opinion. The conservation of material should not be handled as a thing apart from the main mechanical organization but as an integral part, equal in importance to the supervision of labor.

We speak of reclaiming serviceable material from scrap, and it is true that large savings have been effected by sorting over parts which have been cast aside by workmen and foremen as no longer of use, but with the proper organization in shops, engine houses and car departments serviceable material should never reach the scrap pile. It is only possible to educate workmen within a limited range as to the importance of conserving material, and we should no more expect our mechanics without direction to exercise proper care in its use than we should expect to operate our shops without the supervision of foremen. Foremen may and should be carefully instructed as to the use of materials, and intelligent, carefully directed effort on their part will undoubtedly net large returns in the reduction of material charges. The paramount duty of the foremen, however, lies in the supervision of labor, and their efficiency in this line should not be impaired by imposing upon them too many additional duties. The foreman's first thought should be for expedition and quality in the performance of the work, and he may at times condemn certain parts (which parts may be easily and inexpensively placed in serviceable condition) in order to avoid delays, or to improve the quality of repairs.

In considering the material proposition, it would be well first to determine where the principal waste occurs. This is in the failure to properly dispose of parts when shipping; lack of judgment in ordering new parts; waste of small parts by workmen in erecting; lack of intelligent supervision in the disposal of parts removed and not replaced; inefficiency of the store department in furnishing the proper parts at proper times.

Very often when engines or cars are being stripped preparatory to making repairs, little or no attention is given to the material removed and its condition. If material charges are to be maintained at a minimum, this is the point where a strict supervision should be initially applied. Whether it be foreman, inspector or material supervisor, there should be some one in charge of the stripping who is thoroughly conversant with the material. He should not allow parts to be removed and thrown in a heterogeneous heap to be sorted out later, as this is a practice which not only causes the loss of parts but often breaks, bends or otherwise damages material so as to render it unfit for use, or at least makes for additional labor in its repair. The time the parts are removed is the time to determine whether or not they have served their full term of usefulness, and not after they have been hauled to the scrap bins. The man in charge should inspect each part as removed to determine; first, whether it can be repaired and replaced without delay or excessive labor; second, whether it may be of use at a subsequent time although inexpedient to replace in its former position; third, whether it is of no further use or would require repairs out of proportion to its value.

In the first case the part should be immediately transferred to the department where the repairs are to be made, or if no repairs are necessary, it should be stored in a properly provided place to await the time it is required. In the second case, it should be turned over to the proper department to receive the necessary repairs, after which it should be returned to the store department and proper credit allowed. In the third case, the proper place for the part is in the scrap bins. After the engine or car is stripped and the material properly distributed it is an easy matter to determine exactly what new parts will be required and then and not until then should new material be requisitioned from the store house. This does not mean, howver, that parts which are known to be defective previous to the shopping of the engine, or car, may not be drawn and machined ready for immediate application, nor that a small stock of finished parts should not be kept on hand, but it does preclude the possibility of new parts being ordered to replace old parts which are still serviceable.

The waste by workmen of small parts, such as nuts, bolts, pins, washers, fittings, etc., is undoubtedly the source of a considerable loss in many shops. For instance, a workman will draw a dozen nuts, and, having used three or four, allow the remainder to lie in the pit or on the floor where they will be lost or will find their way to the scrap bins. The education of individual workmen in habits of economy will, in a shop with a comparatively steady force, accomplish much toward the elimination of such waste. In a shop with a constantly changing force little can be done along this line, and in such cases the minimization of such losses devolves upon the foremen. Requisitions for small parts should not be indiscriminately issued on the request of workmen, but the foreman should know approximately what quantities are needed and order accordingly.

After the repairs on an engine, or car, have been completed there is always more or less material left over, some of which may be still serviceable, and these parts should be carefully checked over, the good being returned to stock, and the scrap disposed of in the regular manner. Careful supervision of the above three items will keep the amount of material so left over at a minimum, and under ideal conditions there will be none at all.

It often happens that an inefficient store department or lack of co-operation between the stores and the mechanical departments will cause waste of material. The store department failing to have on hand proper material is a frequent source of embarrassment, as this condition incurs delays or necessitates

the manufacturing of parts at high cost. The mechanical department should keep the store department informed well in advance of demand, as to the quantity and quality of material needed. The store department so informed should see that parts are on hand when needed, at the same time exercising caution to prevent an over supply being carried.

As to whether or not special men are required to effect material economies depends entirely on conditions. In a small shop, not overburdened with work, the extra expense of a special material man should be unnecessary. In a large shop where the burden of supervision is heavy a material supervisor should be an important member of the controlling force. Whatever plan is employed at individual points, whether the handling of material is delegated to the regular force or to a special man, there should be at the head of the division, or system, one man who makes the study of material efficiency his business, and who has at his command accurate data for the comparison of the performance of different divisions or points, and who possesses the personality and energy to keep the whole organization keyed up to the proper economic pitch.

So far our consideration of the material problem has been directed mainly to the shops and larger points where repairs are made. Before concluding, however, something should be said concerning the small engine houses and repair yards. It will be found that the proportionate waste of material at the smaller points is greater than at the large points and excusably so, as they are not equipped with the facilities for making extensive repairs, and must perforce apply new parts which at a larger point would be repaired and replaced.

To minimize such wastes, foremen at minor repair points should be carefully instructed as to what parts may be made serviceable without excessive cost, and such parts when removed should, instead of being relegated to the scrap, be shipped to the main shops to be repaired and returned to stock. It will also pay to have a general or division material man make a periodical inspection of the scrap bins at outlying points to see that the local foremen are exercising proper supervision over this item, and to further instruct them in the line of what material should be saved. The methods of conserving material which have been suggested are not untried theories, but have been given a thorough demonstration effecting a net saving of about 30 per cent. in the material account on a group of divisions.

LOCOMOTIVE SHOP KINKS

BY CHARLES MARKEL,

Shop Foreman, Chicago & North Western, Clinton, Iowa.

TRUCK FOR TRANSPORTING TENDER WHEELS.

The truck shown in Fig. 1 is used for carting tender or engine truck wheels. The wheel is carried, as shown, by the 2¼ in. x

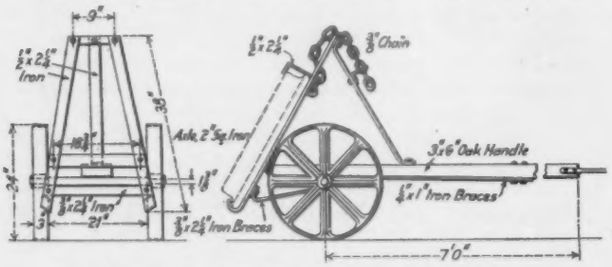


Fig. 1—Truck for Carrying Tender Wheels.

½ in. iron framework and is held from falling by the ⅜ in. chain and clamp. The wheels are 24 in. in diameter and are located 21 in. apart. The handle is 7 ft. long and is made of oak, 3 in. thick x 6 in. wide, provided with 1 in. x ¼ in. braces. When loading the truck the handle is raised until the lower end of the frame rests on the ground and the wheel, which is lying flat on the ground, is lifted so that the flange fits into the frame, as shown. With a fairly good floor this truck will save considerable time and will be found safer than rolling and balancing the wheels around the shop, as is often done.

PORTABLE SAND BLAST APPARATUS.

The portable sand blasting apparatus, shown in Fig. 2, has been found convenient for use out of doors, when sanding tenders, tank cars, etc. It consists of a tank 36 in. high and 26 in. in diameter, in which the sand is contained. The air hose is connected as indicated and air is delivered on top of the sand in

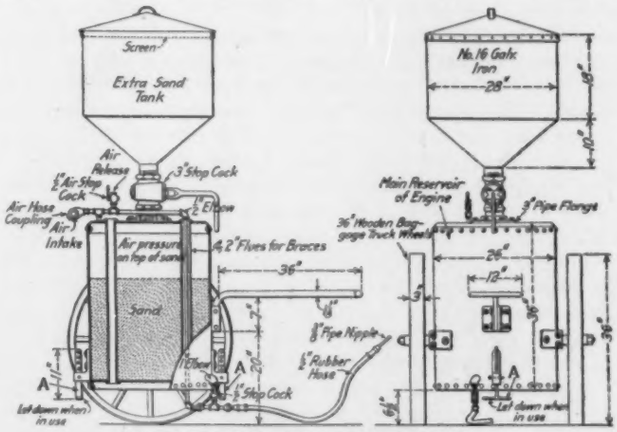


Fig. 2—Portable Sand Blast Apparatus.

the tank as well as into a nozzle which leads from the bottom of the tank. When the tank is in use the two legs *AA* are let down until they rest on the ground and are then fastened in place by pins. The sand tank shown above the main tank contains an extra quality of sand, which, when the sand is exhausted from the main tank, may be allowed to flow into it through the 3 in. stop cock shown, the air being first exhausted from the main tank through the ½ in. air stop cock.

AIR PUMP CRANE.

The crane shown in Fig. 3 has been found very serviceable in removing or applying air pumps to locomotives. The framework is made of 1¼ in. pipe and a piece of 2½ in. x ½ in. bar-iron is used for a runway. The two legs have adjustable rods which fit inside the pipe and are fastened by ½ in. pins, allowing the height of the crane to be adjusted. One end of the bar-iron runway is held by two pieces of 1¼ in. pipe, that have U's in

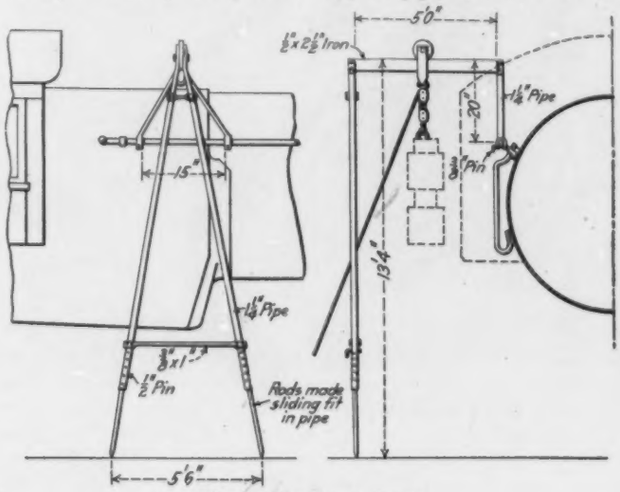


Fig. 3—Air Pump Crane.

their lower ends which slip over the handrail of the locomotive. A one-wheel trolley operates on the runway and is provided with a block and tackle. The illustration shows a pump which has been raised and is ready for application.

MECHANICAL DEPARTMENT ORGANIZATION

Increased Supervision in the Mechanical Department of the Illinois Central has Resulted in More Effective Service and Marked Improvements in Efficiency

A substantial improvement was made in the condition of the cars and locomotives on the Illinois Central during the fiscal year of 1910-11, as compared to the previous year. At the same time the cost of maintenance of freight cars was decreased from $134.01 to $93.96 per car, while the cost of passenger cars was reduced from $1,001.00 to $883.28 per car. The cost per locomotive remained about the same, but the condition of the motive power was very considerably improved. One of the most potent reasons for the splendid showing was the increased supervision which was developed under the leadership of M. K. Barnum, the general superintendent of motive power, who went to the Illinois Central near the close of the fiscal year 1909-10.

Some idea of the improvements which have been made in the organization and their possible effect on future economies may be gained from a detailed study of the organization. As may be seen from the accompanying map, the Illinois Central operates in 14 states, reaching from Minnesota and South Dakota on the north to Louisiana, Mississippi and Alabama on the south, and from Indiana and Kentucky on the east to Nebraska on the west. Compared with the Chicago, Burlington & Quincy, whose mechanical department organization was described in the *Railway Age Gazette* of May 6, 1910, page 1136, it has 6,125 miles of track or 2,950 miles less than the Burlington. On the other hand it has 188, or about 12 per cent. less locomotives, and about 5,700 more cars.

The headquarters of the mechanical department are at Chicago, and here also are located the Burnside shops, the largest on the system. These shops are under the control of a shop superintendent, while the eleven other shops on the system are operated under the direction of the master mechanics on whose divisions they are located. The fourteen divisions and the headquarters of the division master mechanics are indicated by the large circles on the map. The figures after the names of the cities and towns show the number of mechanical department employees at each point.

The organization is outlined on the accompanying chart. In increasing and perfecting the supervision it was aimed to cover

MOTIVE POWER DEPARTMENT ORGANIZATION—ILLINOIS CENTRAL.

- General Superintendent Motive Power.
  - Supt. of Machinery...
    - Master Mechanics
    - Supt. Burnside Shops
    - Supt. Floating Equipment
    - General Boiler Inspector
    - General Locomotive Inspector.
    - Air Brake Instructor
  - Supt. Car Department..
    - Master Mechanics
    - Supt. Burnside Shops
    - Gen'l Car Inspector (Nor. Lines)
    - Gen'l Car Inspector (Sou. Lines)
    - Gen'l Piece Work Inspector
  - Mechanical Engineer...
    - Gen'l Pattern Inspector
    - Inspector of Test Devices
    - Chief Draftsman
    - Draftsmen
  - Engineer of Tests.....
    - Asst. Engineer of Tests
    - Material Inspectors
    - Fuel Inspectors
    - Chemists
  - Electrical Engineer....
    - Asst. Electrical Engineer
    - Shop Electricians
    - Train Electricians
  - Air Brake Engineer
  - Shop Engineer.....
    - Asst. Shop Engineer
    - Draftsmen
  - General Inspector of Tools
  - General Mechanical Inspector
  - General Inspector of Office Work
  - Chief Clerk

thoroughly all of the various places of the work, even at the possible danger of overlapping authority, although in actual practice no trouble of this kind has occurred. It was also felt that the car department should receive more attention and recognition than is usual on most roads. The locomotive department is in charge of a superintendent of machinery and the car department is in charge of a superintendent of the car department. Both of these officers report direct to the general superintendent of the Burnside shops report to the superintendent of machinery on matters referring to the locomotive department and to the superintendent of the car department on matters referring to the car department. In the absence of the general superintendent of motive power, the superintendent of machinery is the highest ranking officer and is in full charge of the mechanical department.

The superintendent of the car department has charge of the maintenance of the freight and passenger cars and the terminal work on trains; where his duties overlap those of the superintendent of machinery they co-operate and work in harmony. The mechanical engineer and other members of the staff are instructed to furnish such assistance and information as may be desired by either the superintendent of machinery or the superintendent of the car department.

The superintendent of floating equipment, who reports to the superintendent of machinery, has charge of the inspection and maintenance of 23 boats, including tugs and barges, which are used for transferring cars at various places on the Ohio and Mississippi rivers. His headquarters are at Paducah, Ky. The machinery and boiler repairs are generally handled in the locomotive shops at that point, while the work on the hulls is done in a contract marine shop at Paducah.

The general boiler inspector supervises the locomotive, marine and stationary boiler inspection for the entire system, visiting the various shops and engine houses, and seeing that the local and federal laws governing boiler inspection are carried out. A record of all the locomotive boiler inspections is kept in his office.

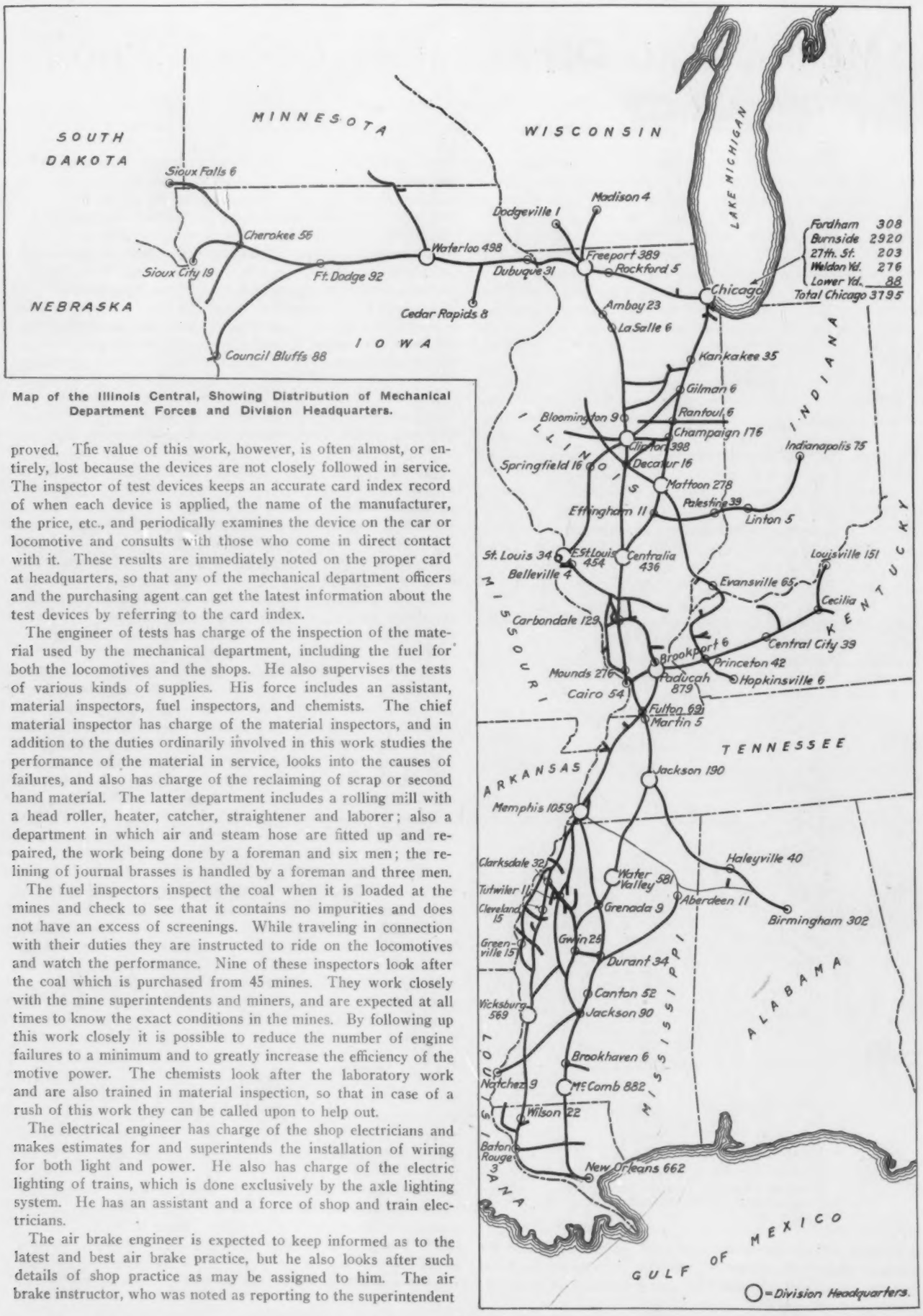
The general locomotive inspector looks after the maintenance and upkeep of the locomotive machinery parts which affect the steam economy, and among other things has been giving special attention to cylinder packing. He also looks after special assignments in connection with the inspection and maintenance of locomotives.

The air brake instructor has charge of the air brake car and looks after the instruction of the enginemen, workmen and shopmen in the operation and use of the air brakes.

The duties of the general car inspectors are evident from their titles. One of them has charge of the territory south of the Ohio and the other of the northern and western lines. They see that the car inspectors understand their duties thoroughly and also instruct the new men. They visit the repair tracks to see that the safety appliance regulations are properly carried out and look after other special assignments. The general piece-work inspector looks after the piece work in the car department.

The mechanical engineer has supervision over the design of cars and locomotives, and also looks after the testing of mechanical devices. He is assisted by a chief draftsman, who directs the work of the drafting room. The general pattern inspector checks the designs of patterns, making sure that excess material is not used. He also looks after the pattern record, which is kept in the form of a loose leaf book. Bulletins of changes of patterns, or new patterns, are sent out under his direction periodically.

The inspector of test devices looks after the special devices which are installed for test purposes. Every road tests new devices to determine whether the standard practice should be im-



Map of the Illinois Central, Showing Distribution of Mechanical Department Forces and Division Headquarters.

proved. The value of this work, however, is often almost, or entirely, lost because the devices are not closely followed in service. The inspector of test devices keeps an accurate card index record of when each device is applied, the name of the manufacturer, the price, etc., and periodically examines the device on the car or locomotive and consults with those who come in direct contact with it. These results are immediately noted on the proper card at headquarters, so that any of the mechanical department officers and the purchasing agent can get the latest information about the test devices by referring to the card index.

The engineer of tests has charge of the inspection of the material used by the mechanical department, including the fuel for both the locomotives and the shops. He also supervises the tests of various kinds of supplies. His force includes an assistant, material inspectors, fuel inspectors, and chemists. The chief material inspector has charge of the material inspectors, and in addition to the duties ordinarily involved in this work studies the performance of the material in service, looks into the causes of failures, and also has charge of the reclaiming of scrap or second hand material. The latter department includes a rolling mill with a head roller, heater, catcher, straightener and laborer; also a department in which air and steam hose are fitted up and repaired, the work being done by a foreman and six men; the relining of journal brasses is handled by a foreman and three men.

The fuel inspectors inspect the coal when it is loaded at the mines and check to see that it contains no impurities and does not have an excess of screenings. While traveling in connection with their duties they are instructed to ride on the locomotives and watch the performance. Nine of these inspectors look after the coal which is purchased from 45 mines. They work closely with the mine superintendents and miners, and are expected at all times to know the exact conditions in the mines. By following up this work closely it is possible to reduce the number of engine failures to a minimum and to greatly increase the efficiency of the motive power. The chemists look after the laboratory work and are also trained in material inspection, so that in case of a rush of this work they can be called upon to help out.

The electrical engineer has charge of the shop electricians and makes estimates for and superintends the installation of wiring for both light and power. He also has charge of the electric lighting of trains, which is done exclusively by the axle lighting system. He has an assistant and a force of shop and train electricians.

The air brake engineer is expected to keep informed as to the latest and best air brake practice, but he also looks after such details of shop practice as may be assigned to him. The air brake instructor, who was noted as reporting to the superintendent

of machinery, is expected to carry out the air brake engineer's policy and instructions, but the details of his work are handled under orders from the superintendent of machinery, as indicated on the chart.

The shop engineer designs all shop additions and improvements, and supervises and carries out all plans for this class of work. In short, he is a specialist in shop design and is expected to keep informed as to the latest and best shop practice.

The general inspector of tools visits the different shops and keeps fully informed as to the condition and efficiency of the machine tools and of the portable tools which are kept in the tool rooms. He also studies the condition and efficiency of the tool rooms and checks all requisitions for tool room supplies. He is required to investigate the best designs of machine tools when lists are being made up for new tools, and he also attends to the transfer of tools between the different shops. In brief, he is expected to be fully informed on the subject of machine tools in the Illinois Central shops and as to the results which may be obtained from the latest designs of tools of the various manufacturers, so that he can advise as to the replacement of old tools, or as to their transfer from large shops to those of less importance.

The general mechanical inspector has been investigating the power situation on the Illinois Central, and has visited all the division officers; a report is in preparation which will recommend such additional new power as may seem best, and also a redistribution of the power now in service. He will be detailed on similar investigations of various kinds, including the economical use of locomotive fuel and shop efficiency problems.

The general inspector of office work visits the various offices and confers with the master mechanic and his assistants to see that all reports are correctly and uniformly made. He also passes on new forms for reports and on other questions in connection with office work. The value of this work is shown by the reduction of about 35 per cent. in the number of mechanical department reports during the past year, although all the necessary information is now being obtained and in better shape than formerly.

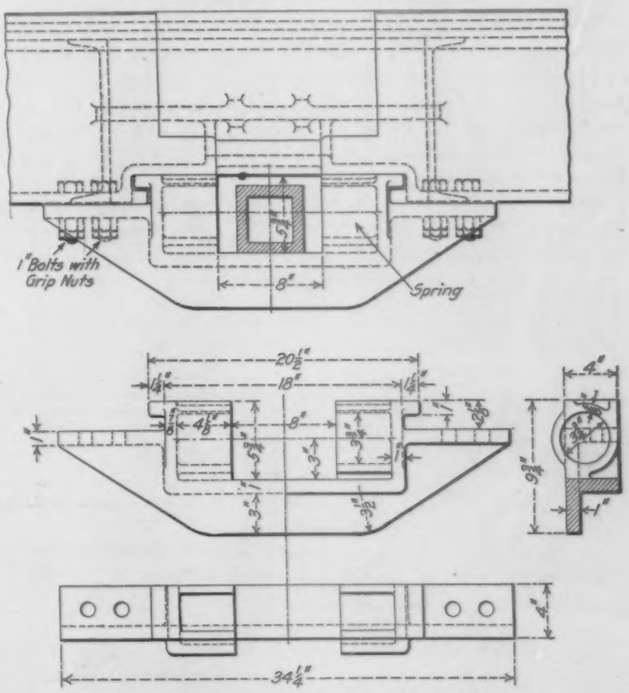
The following account of the way in which he has handled the work may be of interest. After studying the reports which were received in the office of the general superintendent motive power he found it advisable to start his investigations by seeing how this data was gathered in its early stages by the master mechanic. The most important outside points were visited and a complete list of the reports made out in connection with the mechanical department was obtained. Each of the master mechanics was then consulted, local conditions were considered, and any reports which were being furnished which were not necessary, or of little or no value, were discontinued at once. The progress of these reports was then followed until they left the hands of the master mechanics; as a result it was possible on January 1, 1911, to eliminate twelve reports and to have five others kept as a local record for the inspection of the master mechanic on his visit to the shops. This left a clear field for the study of the reports coming from the master mechanic's office to the superintendent motive power. These were carefully investigated and listed, and those which were not desired were cut out. It was found that many of the report forms were obsolete and that others could be consolidated. Each separate form was discussed with the master mechanics in order to prevent the elimination of any that might be needed for recording purposes. Up to October 21, 1911, 178 of the forms had been entirely revised, 47 eliminated and 23 others were consolidated into eleven forms, thus making a total reduction of 76 forms, including the 17 which had been eliminated January 1, 1911. It is quite probable that a larger reduction will be made as the stock of certain forms runs out.

By the gradual elimination of unnecessary forms the clerks in the offices of the master mechanics have been able to give more care to necessary work. The duties of each clerk have been studied and by a rearrangement of their work it has been possible to practically eliminate overtime among the clerks, thus creating a much better condition. Formerly the master mechanics were required to furnish the superintendents with reports different from those which were sent to the superintendent of motive power; in many instances the superintendents have found that they could use a carbon copy of the superintendent motive power's report, with a consequent reduction in clerical work.

The chief clerk, whose name appears last on the organization chart, performs the usual duties of this office for the entire mechanical department at the general offices in Chicago.

CAST STEEL DRAWBAR CARRIER

In connection with the description of the balanced compound Pacific type locomotives for the Santa Fe, given on page 65 of our February issue, it was mentioned that the rear end sill of the tender was provided with a drawbar carrier of special construction, by means of which the weight of the carrier as well as the drawbar was supported by lugs which interlocked with similar lugs on the cast steel end sill of the tender. The advantages of this construction are readily apparent. The four 1 in. bolts used are intended simply to keep the carrier from becoming displaced and not for supporting any of the weight, this being carried entirely by the lugs, which are 1 in. x 1¼ in. x 4 in. It will be seen that even if the nuts on these bolts are lost, they will still hold the carrier in place. Pockets are provided on either side for centering springs.



Cast Steel Drawbar Carrier for Tenders.

USING OLD BOILER LAGGING.—The practice which is in use at a number of progressive railway shops of collecting the lagging removed from boilers when they come into the shop and placing it in a flue rattler together with some old grate bars and flues, thus grinding it up and by the addition of a small amount of new material making it suitable for use again, has proved most profitable at the Clinton shops of the Chicago & North Western. Chas. Markel, the foreman, states that the saving with this method amounts to more than $21 per boiler and that the reworked lagging is fully as good as that which is entirely new.

STEEL CAR SHOP KINKS

BY LEWIS D. FREEMAN,
Special Tool Designer, Baltimore & Ohio, Baltimore, Md.

TONGS FOR HANDLING HOT PLATES.

Many styles of hooks are used for handling hot car sheets, but most of them are unsatisfactory, as they are awkward to handle and the sheets lose considerable heat while they are being taken from the furnace to the work. A special design of tongs is shown in Fig. 1. These not only take a firm hold on the sheets but allow the workman to handle them easily. One end has jaws made of machine steel, the upper one of which is forked to hold a cam. This cam grips the sheet firmly and is operated by a rod extending along the length of the handle. Two rods, ⅝ in. in diameter, are fixed at convenient places on the handle, to provide a convenient grip for the workman. To grasp the sheet the cam rod is pushed forward which throws the cam up as far as possible; after the sheet has been inserted in the jaws the cam is pulled back and the harder it is pulled the firmer it grasps the sheet. The cam shown in this illustration will work satisfactorily on sheets up to ⅝ in. in thickness, but on heavier sheets one of less radius should be used.

BRIDGE PLATES FOR SHOP HOSE.

In shops where the air hose is laid on the floor, across aisles and in the path of the shop trucks, a bridge plate such as shown in Fig. 2 will be found valuable. Without it the hose will soon become cut and worn and the usual wire covering will be crushed and bent out of shape, restricting the flow of air and causing the hose to deteriorate more rapidly. This plate may be made from scrap smokebox extensions or steel car plate ranging from ¼ in. to ½ in. thick, and is bent as shown in the illustration. It may be made to any width, and where the gage of the trucks is wide it will be found more convenient to use two small plates instead of one large one, as they will be much lighter and easier to handle.

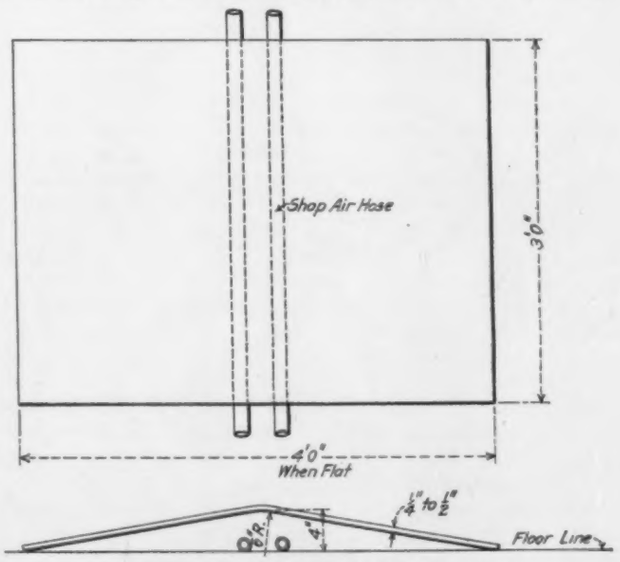


Fig. 2—Bridge Plate for Protecting Shop Hose.

PNEUMATIC RIVET CUTTER.

Where large numbers of steel freight cars are being repaired it is necessary that the tool equipment be maintained as efficient as possible. Many times a special tool is found necessary, and the one shown in Fig. 3 has proved to be valuable as a rivet cutter for general steel car work and especially in the case of badly damaged cars. Although this device is portable it has been found more practical to bring the cars to the machine rather than to try and carry it around through the yard, for it can be set up and adjusted more readily where conveniences are at hand. The best way to use the machine is to anchor it to a suitable back stop or upright post.

The cylinder is made from a hot rolled seamless steel tube, 4½ in. inside diameter and 5¼ in. outside diameter. This tube is supported on a framework of wrought iron which is mounted on an axle with two 18-in. wheels. Two wrought iron blocks form the connection between the cylinder and the frame, the cylinder being held to them by U-bolts, which are applied hot and shrunk on. The inside of the cylinder is reamed with a special reamer

Style	A	B	C	D	E	F	G	H
No.1	6'0"	12"	-	-	15"	33"	with off	4'5"
No.2	10'0"	18"	30"	30"	12"	-	with	8'8"

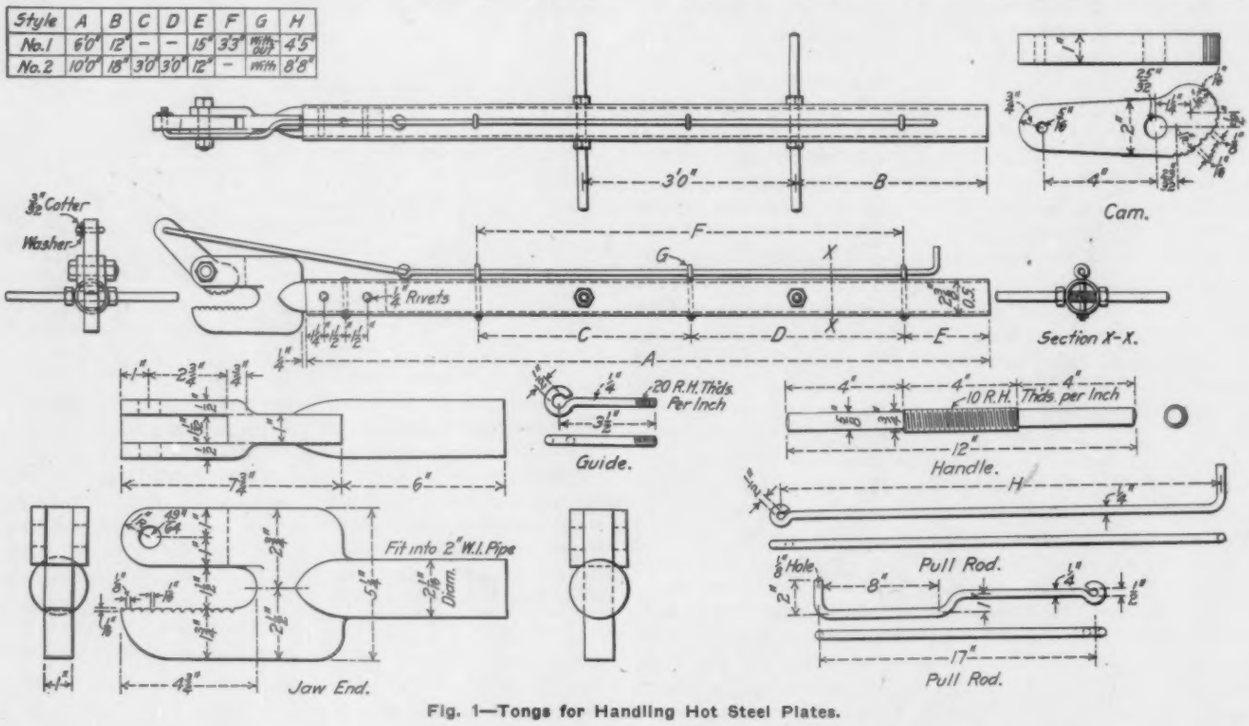


Fig. 1—Tongs for Handling Hot Steel Plates.

and contains a machine steel piston 16 in. long which is provided with the necessary packing rings. A piece of tool steel is inserted in the front end of this piston and serves as a suitable surface for striking the end of the chisel bar, as will be described later. A cast iron head, having a 1 9-16 in. hole for the chisel bar, is screwed on to the front of the cylinder. This head is also bolted with four ⅝-in. bolts to a steel flange which is shrunk on the cylinder. In each end of the cylinder is a rubber cushion 1¾ in. thick, which prevents any heavy direct blow on the cylinder heads. The dotted lines through this rubber cushion, shown at the left in Fig. 3, indicate the location of the chisel bar, which is shown in detail in Fig. 4, in its working position. The length of the chisel bar varies from 4 ft. to 9 ft. and it is made from 1¼-in. hexagonal or octagonal tool steel. A U-shaped guide *B* is bolted on a lug in the front cylinder head and acts as a guide for the anchor cable. The back cylinder head has a lug cast on the top center line to hold the anchor cable reel. This reel is made of cast iron and is mounted on a frame made of 1½-in. wrought iron plates. It is operated by a handle through two gears, as shown. On the left hand side of the reel is a ratchet wheel and pawl, which keeps the cable taut and helps to absorb the shock when cutting rivets; the outer end of the cable is fastened to the work or to some fixed object.

A brass tee is fitted into the back cylinder head by means of a nipple and the throttle lever is fastened to a block fixed in the opposite end of this tee. A brass manifold *D* is connected to the middle opening of the tee and contains a wrought iron piston valve *E*, which has four packing rings. Slide valves are located at *F* and *G* in the main cylinder, the front valve having three ⅜-in. holes and the rear valve having only one ⅝-in. hole. These valves are for the exhaust and they operate on brass seats, which are brazed to the steel tube. With the throttle lever in the position shown in the illustration the air enters the manifold in front of the piston valve at the point marked "shop air connection." From there it flows forward through the 1-in. iron pipe to the front end of the cylinder. The slide valve *F* being closed, the incoming air forces the piston back to the rear of the cylinder, provided, of course, that the chisel bar is in its working position, thus closing the 1 9-16 in. hole in the front cylinder head. It will also be noticed that the slide valve *G* is open, which allows the air back of the piston to escape as it is forced backward. Three holes are provided in the front end and one in the back, so as to allow a more rapid exhaust on the driving stroke and a slower exhaust on the return stroke, which will keep the piston from striking the rear head with a very severe blow.

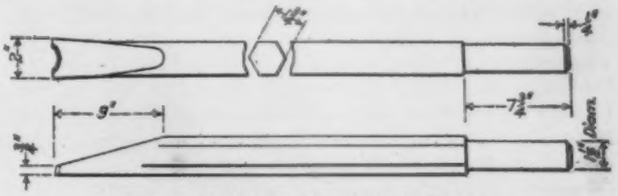


Fig. 4—Chisel Bar for Cutting Rivets.

When the throttle lever is in its full backward position the front exhaust valve will be open and the rear valve closed, and the piston valve *E* will be moved over to the other side of the air connection allowing the air to go up through the tee *C* and drive the piston forward. The tool steel plug in the end of the piston will strike the chisel bar with sufficient force to cut off a 1¼-in. rivet at one stroke. This apparatus can also be used for

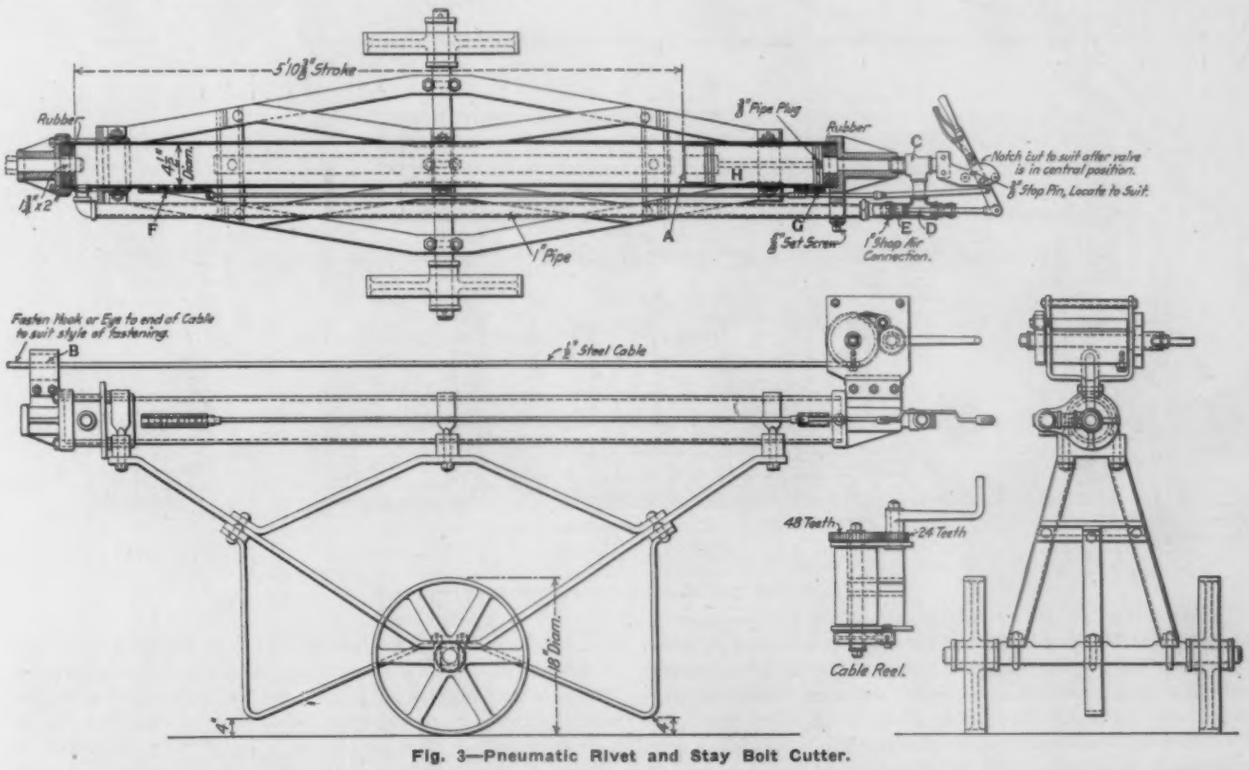


Fig. 3—Pneumatic Rivet and Stay Bolt Cutter.

a staybolt breaker by making a few changes. It will be necessary to remove the cable reel and carriage, and substitute a suitable set of rollers and a rectangular bar to bolt to the back of the boiler.

100-TON HYDRAULIC PRESS.

A simple design of hydraulic press for making right angle bends in steel car plates is shown in Fig. 5. It has a capacity of 100 tons when operated by a hydraulic pressure of 1,000 lbs. per sq. in. The sets of 9½-in. cylinders having outside packed plungers are used for the heavy work and two 14-in. cylinders operated at 100 lbs. per sq. in. air pressure, are used for light work. The capacity of the press with the air cylinders is 15 tons.

A right angle bend can be made on a plate 11 ft. long and should it be desired to flange the adjacent side, the plate can be turned and flanged again, there being sufficient clearance on each side of the die to accommodate the first flange.

Construction.—The main frame consists of four columns of 2½ in. x 5 in. wrought iron bars bolted to the base and the top cross piece with two 1½-in. bolts in each end. The lower ends of these columns are turned under the base to provide a more rigid construction. The base is built up of three 15-in. I-beams and has two ½-in. wrought iron plates on the bottom and one ½-in. wrought iron plate on the top, which serves as the cylinder support. The sides of the base are also covered with plates and cast iron separators are placed at intervals between the I-beams and the plates. The whole base is bolted together with several 1½-in. bolts. The male die is held by a similar structure on the top, two 15-in. I-beams being used instead of three. These beams also have wrought iron plates on the top and bottom and are further strengthened by two 1½-in. truss rods extending 18 in. above the I-beams at the center. The die, which is made from a 5½-in. T-rail, is fastened to a cast iron block, 3 in. thick. The receiving die is made of cast iron and has a V-groove 2 in. deep. This die is supported by a girder built up of four 8-in. channels with two ½-in. wrought iron plates placed vertically between them, as shown in the illustration. Cast iron pockets which receive the plungers from the hydraulic rams are fastened to a 1½-in. plate on the bottom of the girder.

Operation.—The lower die is raised by the plungers of the rams, the four corner columns serving as guides. Each hydraulic cylinder has its operating valve connected to one operating lever, while the air cylinders are operated separately. The machine is placed in a pit on a concrete foundation, so that the dies are 2 ft. above the floor. A light capacity jib crane will be found very useful for handling the material in connection with this machine. The press will be found a valuable addition to shops handling steel car work and will bend sheets cold up to 5-16 in. thick without injuring them. The chief advantage of the machine is in its arrangement for handling work which requires comparatively low pressures, as well as that which requires high pressures, but with the less expensive and more rapid method of operation.

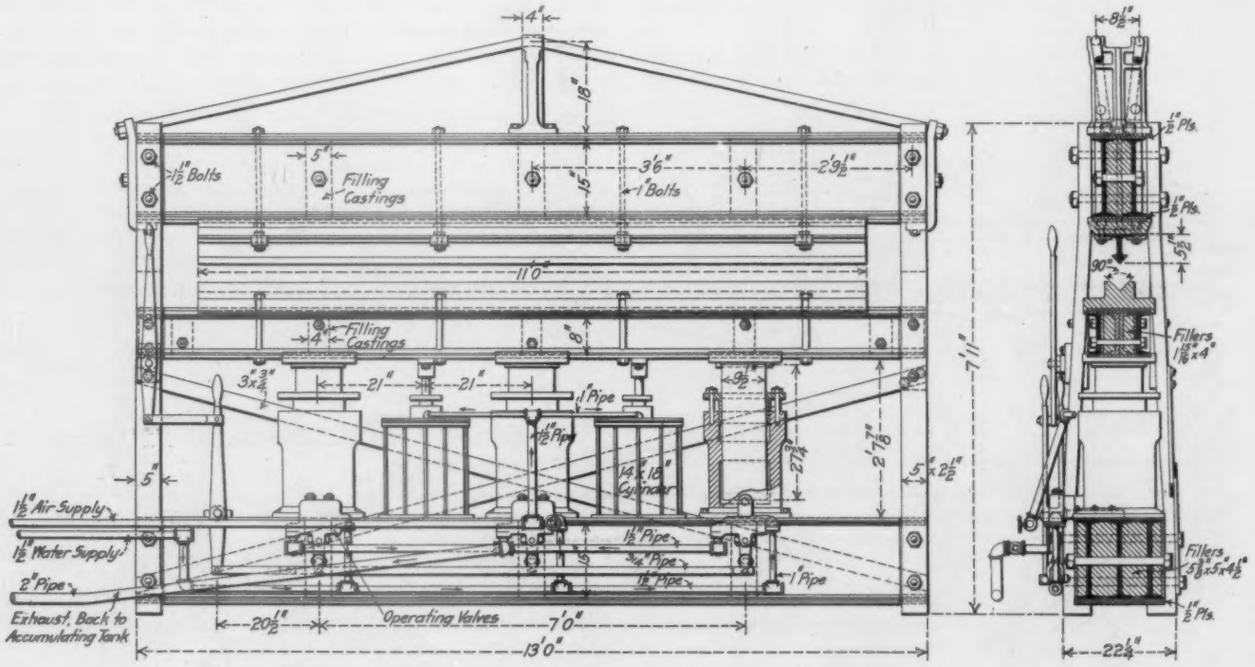


Fig. 5—100-Ton Hydraulic Press for Steel Plates.

RECLAIMING SCRAP MATERIAL*

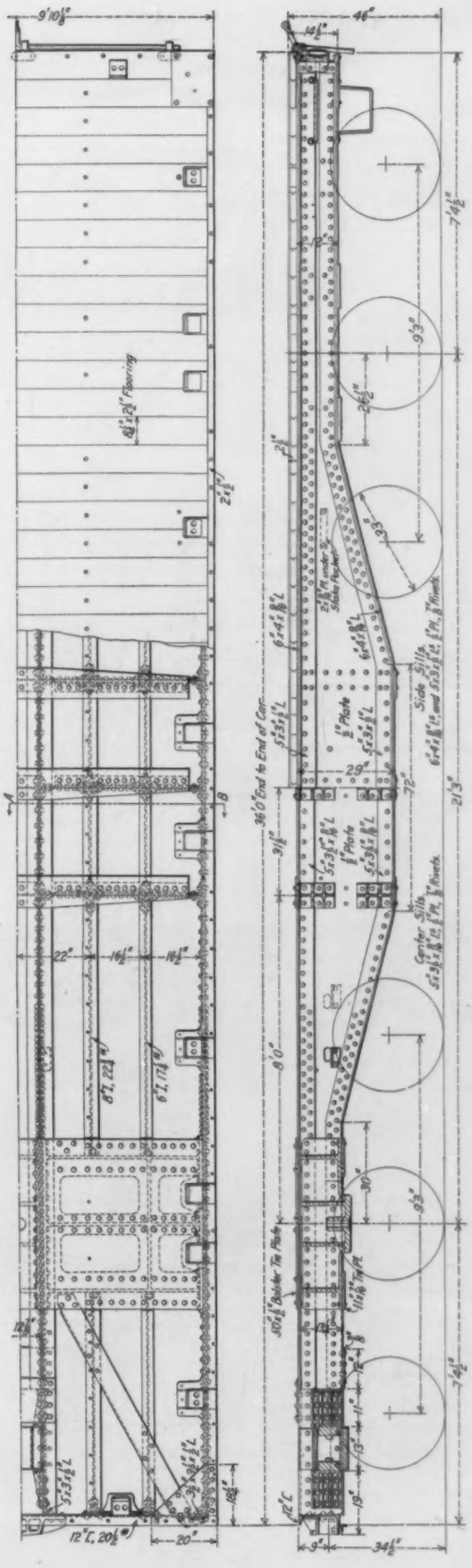
BY W. L. W.

In reclaiming scrap or second-hand material it is wise to have a committee of three appointed for about three months at a time to look over the scrap bins once or twice a week. The committee members should be men capable of using good judgment and should be thoroughly familiar with the different types of locomotives and cars. A great many of the older locomotives, when they need a heavy overhauling, find their way to the scrap bins, and unless one member of the committee is thoroughly familiar with these engines there might be a lot of material reclaimed which seemed good but would be laid aside for an indefinite time, perhaps never having any call to use it. This is not good policy. The above scheme also refers to car work, as a great quantity of good material from the cars finds its way to the scrap bins; if competent men are assigned to this work at different times a large amount of money will be saved for the company.

A good preventive for serviceable material getting to the scrap bins would be for the foremen in charge of the different classes of work to examine the scrap before it leaves their departments. This is especially true of nuts, bolts, spring hangers, gibs, and pins; a great number of bolts removed from frames could be used again instead of being consigned to the scrap pile. For instance, on pedestal brace bolts, when the braces are taken to the blacksmith shop to be closed in, the bolts in many cases have to be removed and the holes reamed out. Some of the holes are larger than others and the old bolts could be changed around, requiring a smaller number of new ones. A great many of the old spring gibs could be used again if they were taken care of.

It is a good plan to educate the men to realize the value of the material with which they work. When they spoil a piece of work a statement should be made out showing how much the company or employer has lost by their carelessness. This ought especially to be done with apprentices; it should be part of their education to work for their employer's interest as well as his own.

*Awarded the second prize in the competition on Reclaiming Scrap Material, which closed February 15, 1912.

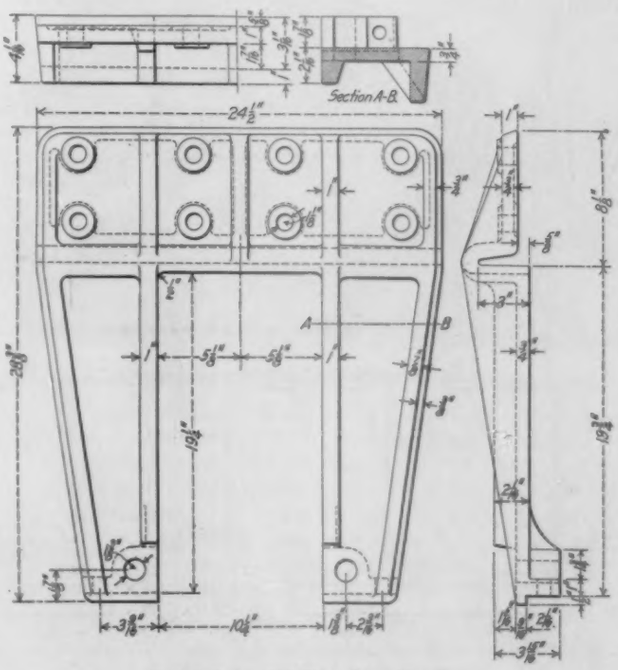


100-TON, 36 FT., FLAT CAR

Pittsburgh & Lake Erie.

For use in special service, and particularly for carrying heavy castings, the Pittsburgh & Lake Erie has designed and built at its McKees Rocks, Pa., shops, five 36 ft. steel cars having a capacity of 200,000 lbs. each. These cars are somewhat similar in their general construction to the 75-ton flat car built by the Lake Shore & Michigan Southern in 1907,* and are constructed entirely of structural shapes and specially designed steel castings.

Four continuous fish-belly sills form the load-carrying members of the underframe. These are in each case girders with ½ in. web plates and having flanges formed by angles. The center sills are 13¼ in. deep from the end sill to a point beyond the bolsters and 29 in. deep for 6 ft. at the center. The two sills are spaced 12⅞ in. apart. The angles forming the flanges at both the top and the bottom are 5 in. x 3½ in. x 9/16 in. This provides a sectional area for the center sills of 64.76 sq. in. The inner angle at the bottom is discontinued at the inner edge of bolster,



Pedestal for 100-Ton Capacity Car.

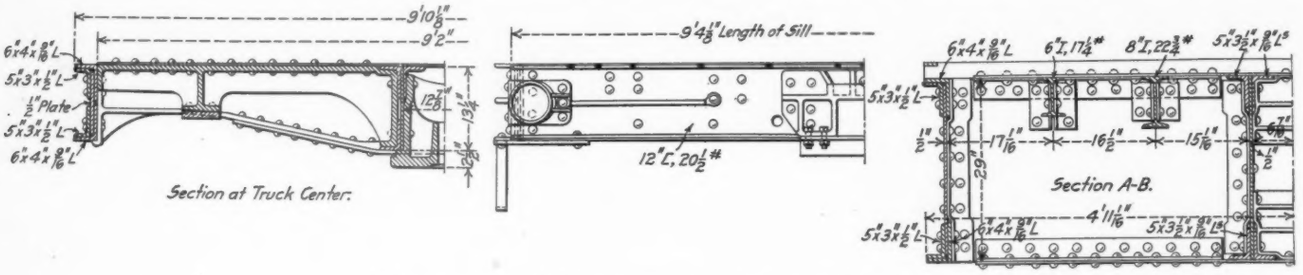
but is continued beyond the bolster to the rear draft lugs. The other three angles extend continuously through the bolster to the draft lugs. The flanges of the side sills are formed of 6 in. x 4 in. x 9/16 in. angles on the inside of the plate with the flanges extending outward and of 5 in. x 3 in. x ½ in. angles on the outside of the plate with their outwardly extending flanges abutting and riveted to the inner angles. The construction is the same at both the top and bottom of the sills. This gives a cross-sectional area of about 32.12 sq. in. in each side sill, or a total for the 4 longitudinal of about 129 sq. in.

Near the center are three sets of built-up cross bearers or diaphragms which are fitted between and secured to the center and side sills. That portion of the cross bearer between the center sills consists of steel castings. A ½-in. cover plate of the shape shown in the illustration stiffens and braces the whole construction at these points.

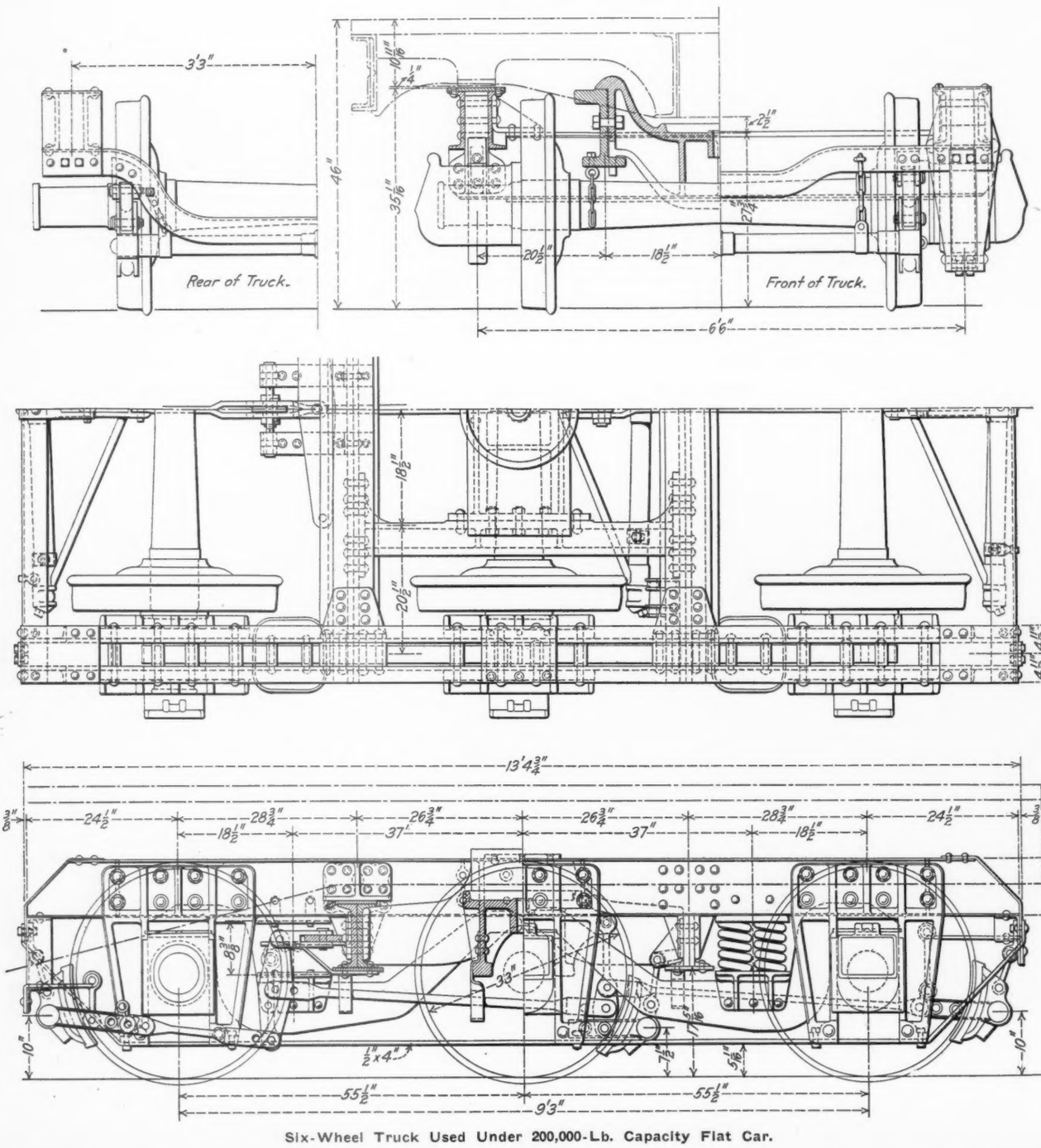
The cast steel bolster, 50 in. wide, is in three parts, the section between the center sills including the center plate. These castings are tied together by cover plates, the top one being 50 in.

*See *American Engineer & Railroad Journal*, June, 1907, page 219.

in width and ½ in. thick and extending continuously between the side sills; the two bottom plates are each 11 in. x 7/16 in. and end about half way between the side and center sills. An 8 in. I beam and a 6 in. I beam are used for floor-carrying members and longitudinal stiffeners. They are secured to lugs on the bolster casting and by angles at each of the diaphragms. At the



Sections of Underframe—100-Ton Capacity Flat Car.



Six-Wheel Truck Used Under 200,000-Lb. Capacity Flat Car.

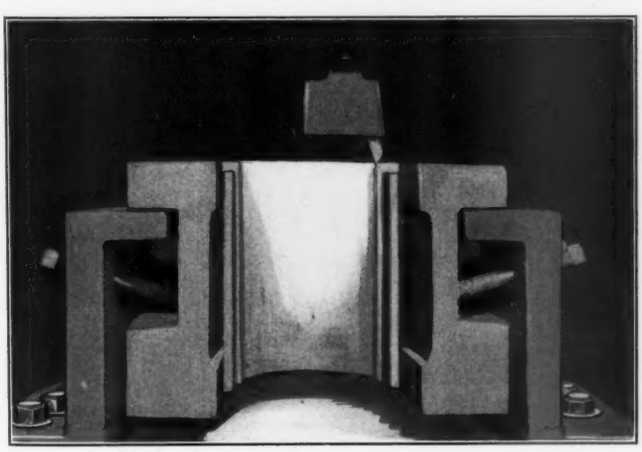
end sills the construction consists simply of a 12 in., 20½ lb., channel end secured to the ends of the longitudinal sills by angles. It is cut out at the center for the passage of the coupler shank, the customary buffing casting forming the re-inforcing around the opening. Diagonal braces are carried as usual from the corners to the center sills at the bolster. Large stake pockets are secured inside of the side sills, the floor being cut away to give admission to them. The 2½ in. flooring is secured to the underframe by a ½ in. plate set in at the top of the outside edges of the floor and bolted through to the flange of the side sill. It is also bolted with counter-sunk bolts to the 8 in. longitudinal I beams.

The 6-wheel trucks have side frames built up of two 9 in. channels placed back to back but spaced about 3¾ in. apart. The transoms are formed of two 10 in. channels placed back to back and secured to the side frames by heavy cast steel brackets. They have top and bottom cover plates, and the load on the truck center plate is carried to them through cast steel members of the shape and arrangement shown in the illustration. An interesting design of double pedestal is shown in detail in one of the drawings. It is made in two parts, the top of each part being arranged to fit over the flange of the truck side frame channel and to be riveted securely to the web of the channel. The bottoms are held together by two 1⅜ in. bolts. The arrangement of the equalizers and springs is clearly shown in the illustration.

ACCURACY IN FINISHING DRIVING BOXES

BY JOHN V. LE COMPTE*

There is probably no operation in the general repairs of a locomotive that causes greater delay to the output of the erecting shop than the failure of the engine to tram after the shoes and wedges have all been planed and applied, the braces have been drawn up snugly in place and the pedestal wedges have been adjusted. It is true that sometimes, especially if old shoes and wedges are used and lined, that the failure to tram may be attributed to the inaccuracy of this work, but in many

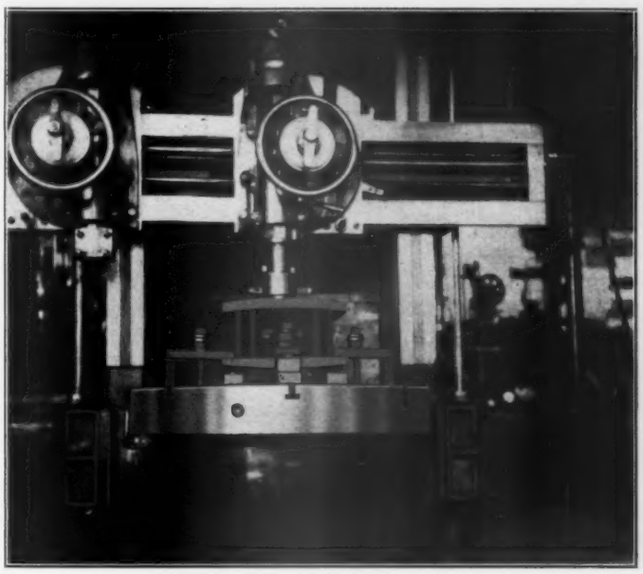


Driving Box Clamped on Boring Mill for Facing.

instances it is directly due to the failure of the machine shop to properly handle the work.

After the driving boxes have been delivered to the machine shop and stripped of the old end-ply liner and crown brasses, if they are worn too thin for future use, the new brasses are applied and the boxes are delivered to the furnace, where the end-play liners are poured. That the end-play liner may be tight on the box and that the cost of drilling holes to prevent the liner from turning may be saved, the box should have the smaller dove-tail eccentric with the large one, the diameter of which should be at least as large as the diameter of the hub of the wheel on which the box is to be mounted. This operation may be done on the machine without a second handling when the old liners are removed.

The box should next be delivered to the boring mill for facing, if, because of the frames being removed for repairs or new frames being applied, it is impossible to allow for the end-play accurately and the output may be delayed because the boxes are not bored when accurate end-play data is secured, the boxes



Driving Box Clamped Preparatory to Boring.

may be trued off to provide an accurate surface to work from. All boxes should be so faced that the flanges on both sides caliper accurately with the liner face.

A knee used by us for this operation to prevent the lost time necessarily required in setting the boxes is shown in the illustration. The boxes are next planed in the shoe and wedge spaces; this operation is necessary as all boxes after having the crown brass and the end-play liner applied are irregular and uneven and this space must be trued off to give the mechanic in the erecting shop an accurate surface from which to secure his sizes for laying off the faces of the shoes and wedges. The planing of the shoe and wedge fit of the boxes must be square with the end-play liner; therefore a knee should be applied to the planer, which is square with platen or bed, against which the driving box should be clamped with the liner next to knee. With this method of performing this operation absolute accuracy is obtained. In boring the crown brasses to fit the journals so that they may be square with the liner and true with the shoe and wedge space, the box must be placed on the boring mill with the hub liner toward the bed. The box should rest on parallel strips and be clamped securely. By following the above method the most accurate work is obtained and much time and money is saved in the erecting shop, as no shoes and wedges will have to be pulled because of the locomotive not traming, due to the boxes not being square and true.

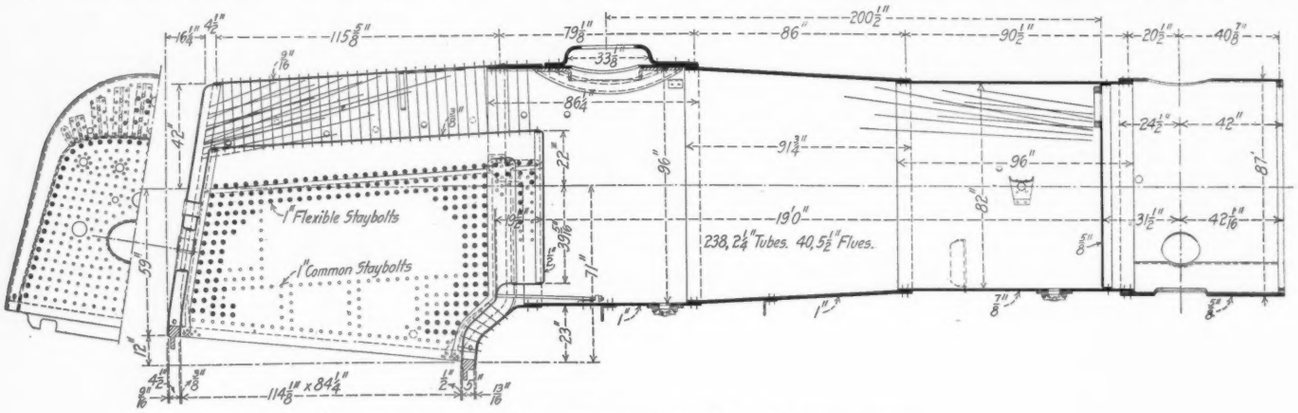
*Foreman, Mt. Clare Shops, Baltimore & Ohio.

GERMAN LOCOMOTIVES EXPORTED.—There were 58,127 tons of locomotives exported from Germany last year. This is more than 45 per cent. greater than the number exported in either 1910 or 1909, but only 7½ per cent. more than in 1908. Of the whole weight, 13,711 tons went to France, 7,480 to Spain, 6,150 to Argentina, 5,314 to Roumania, and 2,295 to Turkey.

MIKADO LOCOMOTIVES OF GREAT POWER

As a Part of a Comprehensive Plan to Reduce Operating Costs by the Use of the Latest Improvements in Locomotive Design, the Chesapeake & Ohio has Recently Ordered 25 Locomotives of the 2-8-2 Type.

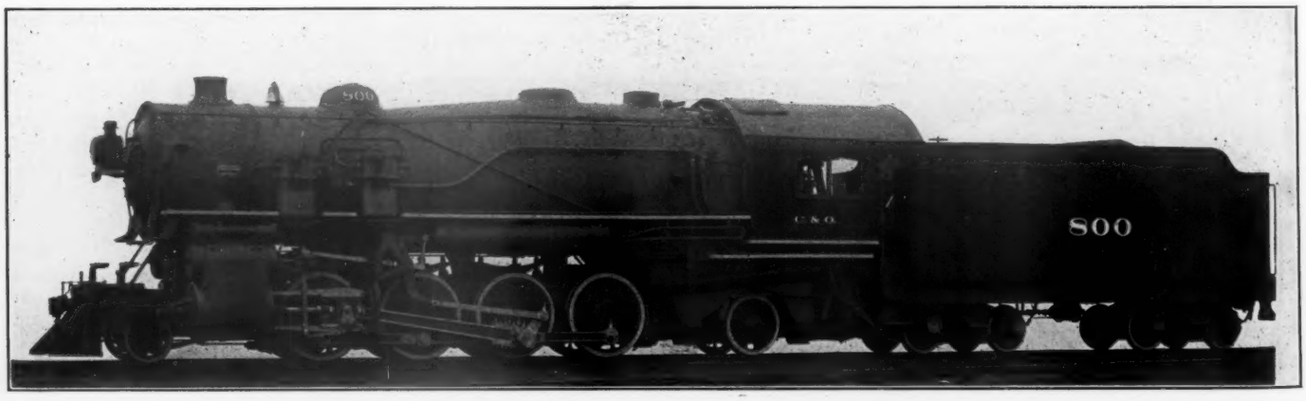
To deliver a drawbar pull of over 27,000 lbs. at 33 miles per hour (2,390 drawbar horsepower), requires a locomotive built on a thoroughly balanced design. It must not only have a large boiler, but one of large capacity—terms which are not always synonomous—and must carry a well adjusted balance between boiler output and engine demand, and must also include capacity increasing devices capable of doing their full duty. That this result has been accomplished with the Mikado was of the Mallet type for use in the mountains of West Virginia.* Twenty-five of these locomotives have been in service for well over a year, and 25 more have recently been ordered. Records of eight months' service show that they give a net saving of 5.7 cents per thousand ton-miles in the cost of handling traffic as compared with the cost when locomotives of the consolidation type were in use. The next class was the development of an entirely original type, termed Mountain (4-8-2) type for



Boiler Which Has Delivered Nearly 2,400 Horse Power.

locomotive on the Chesapeake & Ohio lends particular interest to the design illustrated herewith from which there have been 24 locomotives ordered in addition to the original engine built by the American Locomotive Company, and designed by its engineers in co-operation with the officers of the railway. The sample engine was designed on the basis of hauling 4,000 tons on a .3 per cent. grade at a sustained speed of 15 miles per hour. What it is actually capable of doing is probably best illustrated heavy passenger traffic on steep grades.† These locomotives since being put into service have been most satisfactory in every way, and easily accomplish the work that previously required two large Pacific type locomotives.

The present Mikados have been designed for use on the comparatively level sections of the road where they will haul trains at moderately high speed and of a tonnage greater even than can be handled by the Mallets in the mountains. It was prob-



Powerful Mikado Loccmotive for the Chesapeake & Ohio.

by the graphical record of a test, shown in one of the illustrations, where trains of nearly 6,000 tons were handled at a speed of from 20 to 30 miles per hour over a road having the profile shown at the bottom of the illustration.

This is the third new class of locomotive developed by the Chesapeake & Ohio during the past two years, forming part of the plans of the management to use the latest improvements in locomotive design to as large an extent as possible, in reducing net operating costs. The first locomotive built for this purpose ably the service given by the Mountain type engine with 600 and 700-ton trains on heavy grades that controlled the design of the Mikado, as a careful comparison will show that outside of some boiler changes the Mikado is essentially the Mountain type, with a two-wheel truck substituted for the four wheel one. Such alterations as have been made resulted in an increase of about

*For illustrated description see *American Engineer & Railroad Journal*, December, 1910, page 471.

†See *American Engineer & Railroad Journal*, October, 1911, page 381.

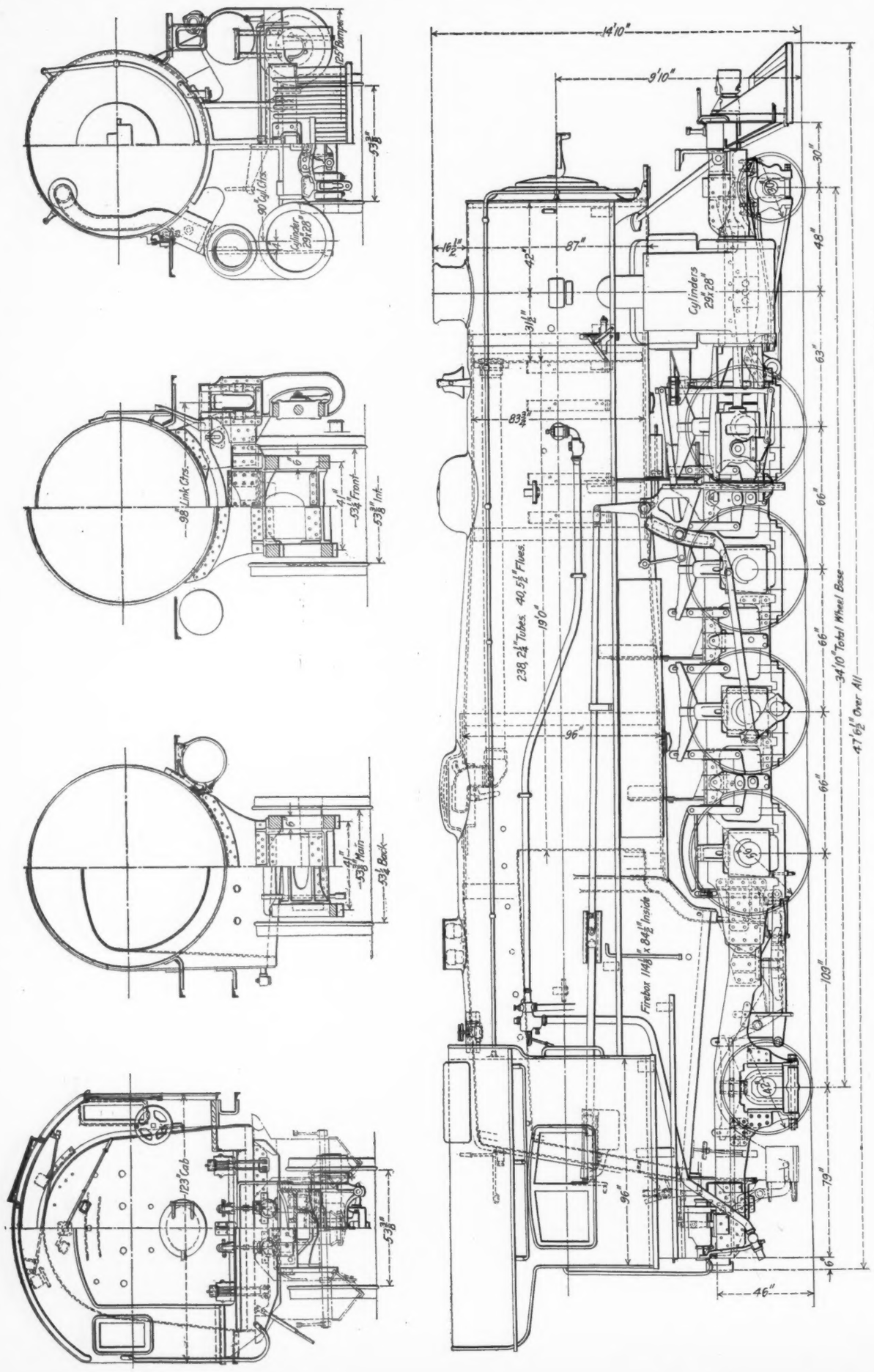
4,000 lbs. of weight on the drivers, bringing it to about 243,000 lbs., or an average of over 60,000 lbs. per driving axle. The total weight, however, was reduced from 330,000 lbs. to 315,000 lbs. While the cylinders are of the same size, 29 in. x 28 in., the use of 56-in. wheels in place of 63-in., and of 170 lbs. boiler pressure as compared with 180 lbs., has brought the theoretical tractive effort up from 58,000 to 60,800 lbs., making this the most powerful engine of its type as regards maximum tractive effort.

The changes in the boiler have been such as to reduce the length between the firebox and the center of the cylinders by about 35 in. This has been done with a reduction in the actual heating surface of only 81 sq. ft., since tubes of the same length are used in both boilers, and the reduction in heating surface is all confined to the combustion chamber, which in the Mikados is 19½ in. in length. The reduction in the distance from the center of the cylinders to the front tube sheet of from 51½ in. to 31½ in. accounts for the remainder, this, of course, not affecting the heating surface. There are also five less 2¼-in. tubes in the Mikado than in the Mountain type boiler, although the diameter of the shell is the same.

The parts that are duplicated on the two classes include practically everything that requires frequent renewal or that needs to be kept in stock. This is impressively shown in the following list:

Trailer truck axles, details of ash-pan rigging, tender truck axles, boiler tubes, boiler flues, dome cap, dome casing, driving boxes, trailing truck boxes, driving box bearings, Elvin driving box cellars, trailing truck box, trailing truck box bearings, trailing truck, cab, blow-off cocks, injector steam valves, cylinder cock operating valves, cylinder cock operating cylinders, crank pins (except front pin), cross head, cylinders, cylinder heads, cylinder by-pass valves, cylinder head relief valve, coupler (pilot), coupler pocket casting, coupler pocket pins, eccentric crank, exhaust pipe, fire door, frame pedestal caps, frame shoes and wedges, frame cross ties (between back and main drivers, between main and inter. drivers), foot plate, chafing plate, grates, grate details, grate shaker rigging, pilot, pistons, piston rod, piston rod packing, parts of screw reverse gear, side rods, main rod bearings, sand box, smoke box front and door, link motion (similar), steam

Graphical Record of a Recent Test of a Chesapeake & Ohio Mikado Locomotive.



Elevation and Sections of Mikado Locomotive for Heavy Freight Service on Low Grades; Chesapeake & Ohio.

chest heads, throttle, dry pipe, valves and packing rings, valve rod and stem, valve rod guide, valve rod packing, driving springs, tender truck springs, tender and details, and tender trucks.

In view of the success of this locomotive in the service for which it is designed, it is interesting to consider the possibility of the Mountain type engine for fast freight work at speeds somewhat higher than is advisable with this engine. If we assume that the Mountain type locomotive will deliver the same horse power at the same piston speed, it will give a 27,000-lb. drawbar pull at 37 miles per hour in place of 33 miles for the Mikado. It would, of course, have a much smaller starting ability, due to the larger wheels. However, for certain classes of service it would seem to be particularly well adapted.

The Mikado, like the Mountain type, is equipped with the Street stoker, Schmidt superheater, and the Security brick arch. It has the screw reverse gear and a 6-hopper ash pan, which were fully illustrated and described in the article on the Mountain type locomotive.

Cylinders.

Kind	Simple
Diameter	29 in.
Stroke	28 in.

Valves.

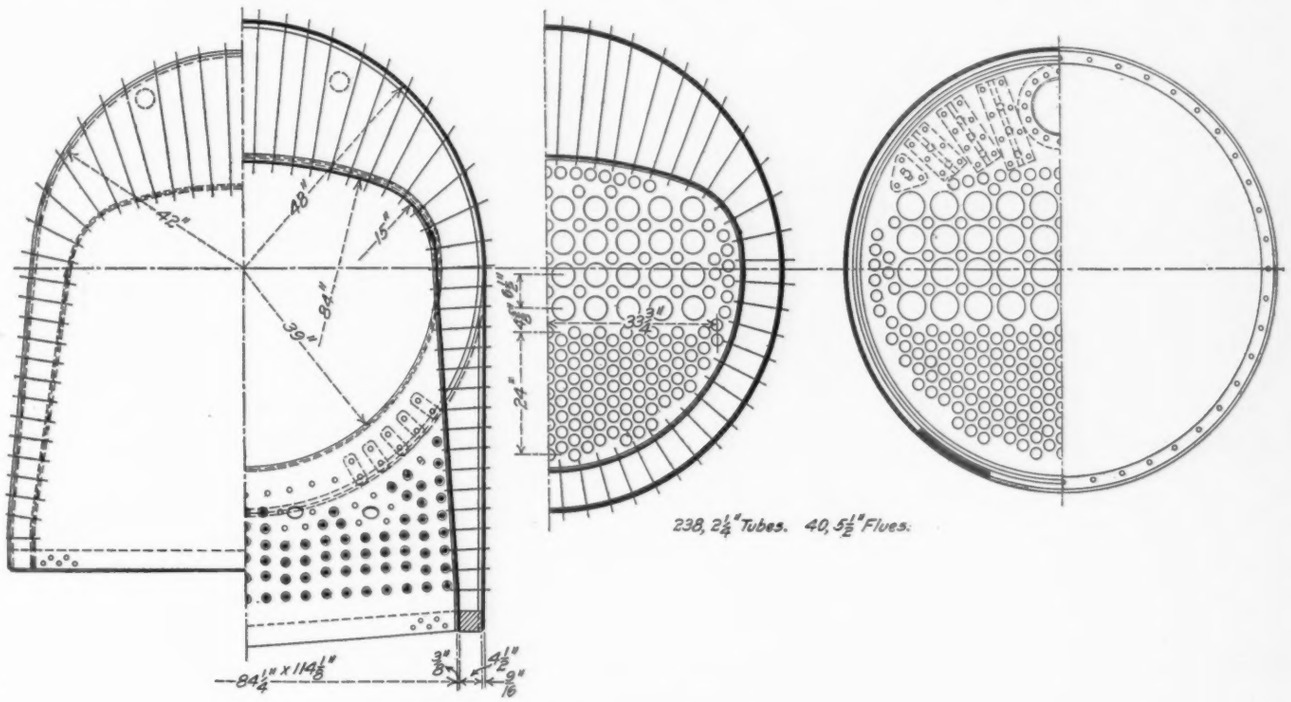
Kind	Piston
Travel	7 in.
Steam lap	1 3/16 in.
Lead	3/16 in.

Wheels.

Driving, diameter over tire	56 in.
Driving, thickness of tire	3 in.
Driving journals, main, diam	11½ in. x 14 in.
Driving journals, others, diam	10½ in. x 14 in.
Engine truck, diameter	30 in.
Engine truck, journals	6½ in. x 12 in.
Trailing truck, diameter	42 in.
Trailing truck journals	9 in. x 14 in.

Boiler.

Style	Conical connection
Working pressure	170 lbs.
Outside diameter of first ring	83¾ in.
Firebox, width and length	84 in. x 114 in.
Firebox plates, thickness	3/8 in.
Firebox water space, front	5 in.



Sections of Boiler for Chesapeake & Ohio Mikado Locomotive.

The general dimensions, weight and ratios are given in the following table:

General Data.

Type	2-8-2
Service	Freight
Fuel	Soft coal
Tractive effort	60,800 lbs.
Weight in working order	315,000 lbs.
Weight on drivers	243,000 lbs.
Weight of engine and tender in working order	484,700 lbs.
Wheel base, driving	16 ft. 6 in.
Wheel base, rear driver to trailing truck	109 in.
Wheel base, total	34 ft. 10 in.
Wheel base, engine and tender	67 ft. 11 in.

Ratios.

Total weight ÷ tractive effort	5.18
Weight on drivers ÷ tractive effort	4.00
Tractive effort × diam. drivers ÷ heating surface	840.
Tractive effort × diam. drivers ÷ *equivalent heating surface	640.
Total heating surface ÷ grate area	60.8
Total *equivalent heating surface ÷ grate area	79.8
Firebox heating surface ÷ total heating surface, per cent	7.00
Firebox heating surface ÷ total *equivalent heating surface, per cent.	5.31
Weight on drivers ÷ total heating surface	60.
Weight on drivers ÷ total *equivalent heating surface	45.6
Total weight ÷ total heating surface	77.8
Total weight ÷ total *equivalent heating surface	59.2
Volume both cylinders, cu. ft.	21.4
Total heating surface ÷ vol. cylinders	188.
Total *equivalent heating surface ÷ vol. cylinders	248.
Grate area ÷ vol. cylinders	3.12

Firebox water space, sides and back	4½ in.
Tubes, number and diameter	238—2¼ in.
Flues, number and diameter	40—5½ in.
Tubes, length	19 ft.
Heating surface, tubes and flues	3,740 sq. ft.
Heating surface, firebox	283 sq. ft.
Heating surface, arch tubes	28.2 sq. ft.
Heating surface, total	4,051.2 sq. ft.
Heating surface, superheating	845 sq. ft.
Heating surface, total equivalent*	5,318.7 sq. ft.
Grate area	66.7 sq. ft.
Center of boiler above rail	9 ft. 10 in.
Top of smokestack above rail	14 ft. 10 in.

Tender.

Tank, style	Water bottom
Frame	13 in. channels
Wheels, diameter	33 in.
Journals	5½ in. x 10 in.
Water capacity	9,000 gals.
Coal capacity	15 tons

*Total equivalent heating surface equals total heating surface (4,051.2 sq. ft.) plus 1½ times superheating surface.

ICE FOR REFRIGERATOR CARS.—During the year 1911 the Pacific Fruit Express Company used in refrigerator car service on the Southern Pacific 1,467,433 cakes of ice, each 39 in. long, 22 in. wide and 11 in. in thickness, the whole weighing 220,115 tons. This quantity would make 11,006 car loads of 20 tons each.

LOCOMOTIVE MACHINE SHOP KINKS

Awarded the First Prize in the Shop Kink Competition which Closed September 15, 1911

BY R. E. DETTE,

Machine Shop Foreman, Pennsylvania Railroad, South Pittsburgh, Pa.

EXTENSION CLAMPING BOLT.

The clamping bolt shown in Fig. 1 is for use on a drill press, or any other machine where the slots are cut through the table. The bolt shown here has 3 tees which answer the purpose of bolts 4 in., 7¾ in., or 10¾ in. in length. It reduces the number of bolts of different lengths to be kept at the drill press, and

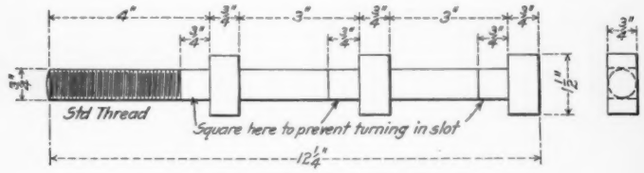


Fig. 1—Extension Clamping Bolt.

saves some time in changing them where much clamping is to be done.

BORING CROSSHEAD PIN BRASSES.

A clamp for holding the crosshead pin brasses while they are being bored out on a lathe is shown in Fig. 2. It consists of the four pieces *A*, *A* and *B*, *B*, which are bolted together as shown in the illustration. The brasses are held in this clamp by screwing up the nuts on the ends of *B*. They are placed on the centering plate *C*, which is held to the boxes by the set screw *F*. In this plate is a center hole which is used to center the brasses in the lathe chuck. The dead center of the lathe is placed in the hole, and the tailstock of the lathe is run up until the box bears against the two parallel bars *D* on the face of the chuck. The jaws of the chuck are then tigthened. The dead center is withdrawn and the centering piece is removed, leaving the box in the correct position to be bored. Much time is saved with this device, because of the ease with which it may be centered on the chuck.

BORING SIDE RODS.

The device shown in Figs. 3 and 4 is used on a horizontal boring machine for setting and clamping the side rods for boring. This method does not require the assistance of a helper to hold

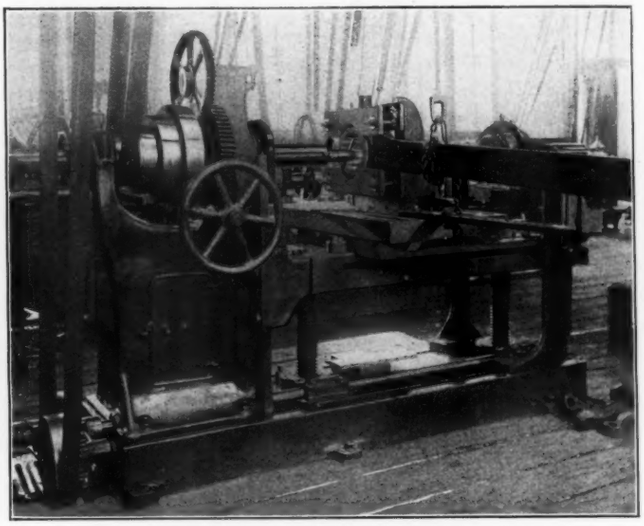


Fig. 3—Clamp for Boring Side Rods.

a straight edge while the operator is setting the work parallel to the face plate of the machine, neither is it necessary to use a square to set the work on the platen of the machine. The tongue on the base of the angle casting *C*, which fits the groove of the

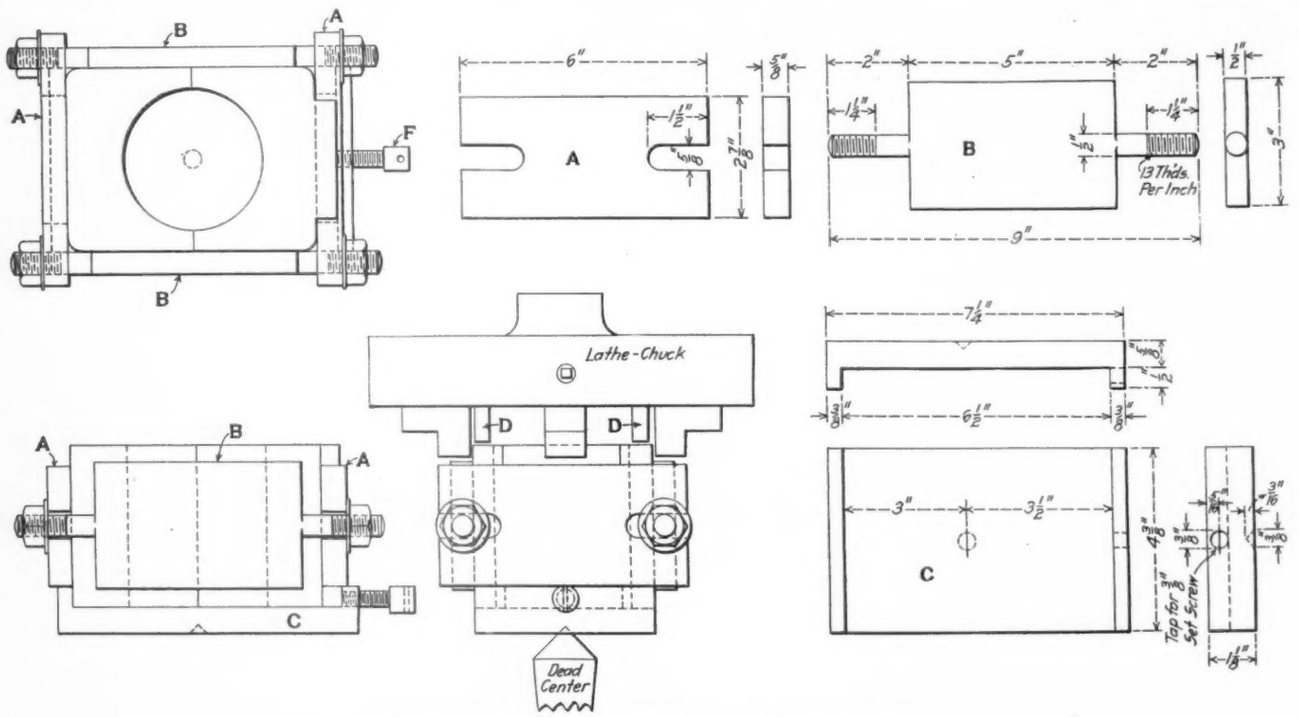


Fig. 2—Handy Chuck for Boring Crosshead Pin Brasses.

The jaws of the chuck are then tigthened. The dead center is withdrawn and the centering piece is removed, leaving the box in the correct position to be bored. Much time is saved with this platen, insures its proper location relative to the axis of the boring bar.

A ¾-in. or ⅞-in. bolt slipped into the holes *E* of the angle casting affords a hold for the hook or the chain of a crane for lifting it on or off the machine. The slots *F* in the angle casting are provided for clamping it to the table when the bolt holes do

not come directly over the T-slots. The use of the parallel and clamping pieces *B*, held by means of the T-bolts, plainly shows how the side rod is clamped to the face plate. The L-shaped piece *D* is bolted to the table of the machine and supports the overhang of the rod.

The angle casting was made originally for boring driving boxes on the horizontal boring machine, and is still being used for that purpose. It is also used for many other jobs of boring or drilling. Nearly all shops have some type of angle casting

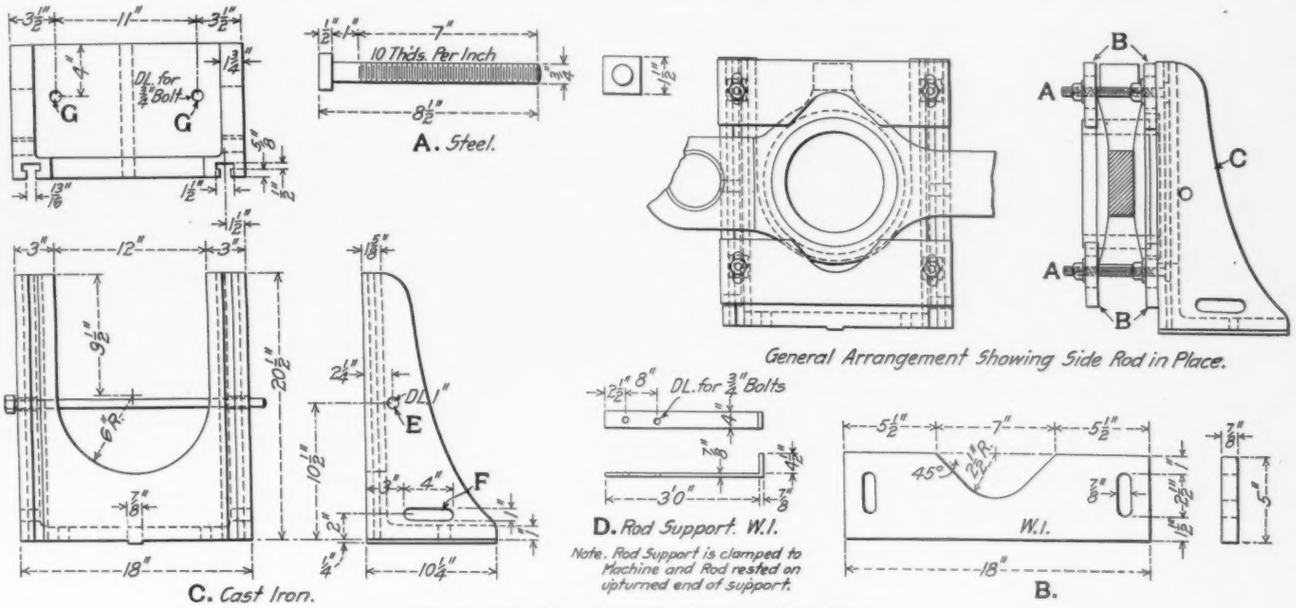

10 Th'ds. Per Inch
A. Steel.
General Arrangement Showing Side Rod in Place.
DL. for 3/4" Bolts
D. Rod Support. W.I.
Note. Rod Support is clamped to Machine and Rod rested on upturned end of support.
W.I.
B.
C. Cast Iron.

Fig. 4—Clamping Block for Boring Side Rods.

which could be converted into a clamp for this purpose, and its use would reduce the cost of the work about 33⅓ per cent.

FOOT VALVE FOR AIR LINES.

The valve shown in Fig. 5 was designed to meet the requirement of a foot valve for operating machines and devices con-

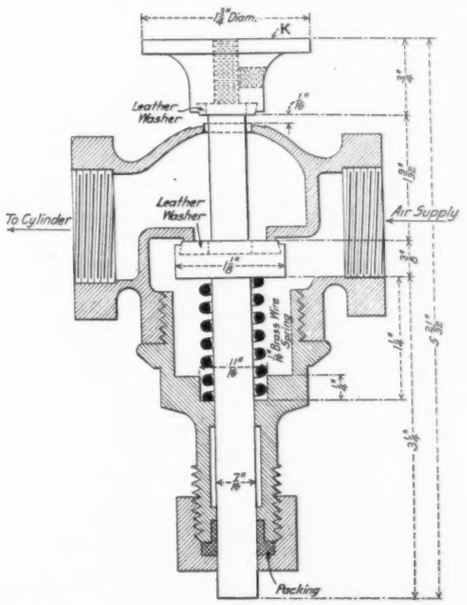


Fig. 5—Foot Valve for Pneumatic Machines.

trolled by air pressure, such as hose stripping machines, hose clamping machines, hose clamp shearing machines, pneumatic vices, etc. The pressing down of knob *K* closes the exhaust opening directly underneath *K* and opens the valve, allowing the air supply to pass to the cylinder. When pressure on *K* is released the valve will be closed by the coil spring, thus cutting off the air supply; the pressure in the cylinder will be released to the atmosphere through the opening around the valve stem. This valve may be made from a globe or Jenkins valve.

DRIVING DOG FOR WHEEL LATHE.

In a shop where it is necessary to turn the journals of driving wheels in the same machine used for turning the tires, and the machine is equipped with the Sure Grip driving dogs, a different arrangement is used when working on the journals. The device shown in Fig. 6 has been very effective for this work, and it is simple in construction. The wedge *C* is inserted in the dog and is held by the wedge *D*, the other end of *C* bearing directly on the spoke. To take up the lost motion or back lash, the fulcrum

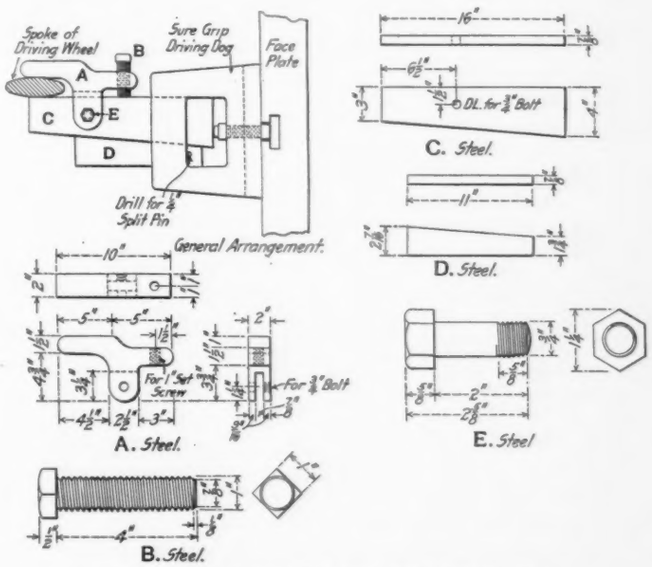


Fig. 6—Attachment for Sure Grip Driving Dog.

clamp *A* is used, being forced against the other side of the spoke by the screw *B*. A split pin is placed in the wedge *D*, as shown, to prevent its becoming loose.

TOOLS FOR PISTON PACKING RINGS.

The tools shown in Fig. 7 were designed for the rapid turning and cutting off of locomotive piston packing rings and for making them to exact size without having to measure the outside or inside diameters, width, or thickness each time a ring was made. The turning and boring tool-holder *C*, when applied to the left head, always takes the same position in relation to the diameter indicator *D*, which registers with the index marks scribed on the crosshead of the boring mill at *A*. The turning and boring tools are adjusted to turn the rings to the standard width by using gage *E*. This gage is placed in the opening *B* of holder and the tools are adjusted to make a sliding fit. The wide part or collar stopped. The parting tool-holder is then brought to position and lowered until the edge of the gage screw bears *H* against the top face of the casting. The dog *K* is then turned to the left, turning the screw *H* with it. This raises the gage screw enough so that it will not bear on the surface of the ring as it revolves. The machine is then started and the parting, boring and turning operate simultaneously.

When the parting tool is nearly through, the V-shaped cutting edge of the tool *M* removes the sharp corners of the lower edge of the ring that is being cut off and the upper edge of the next ring to be cut. The parting tool *N* sets in the holder *P* and the champering tool *M* is placed on top of it, as shown on the drawing. When the ring has been cut off the tools on the left head are raised and the ring is removed. The vertical feed used for the turning and boring operation is about 1/32 in., and for the parting operation 1/64 in. This method of turning packing rings makes a good finished ring in a minimum amount of time.

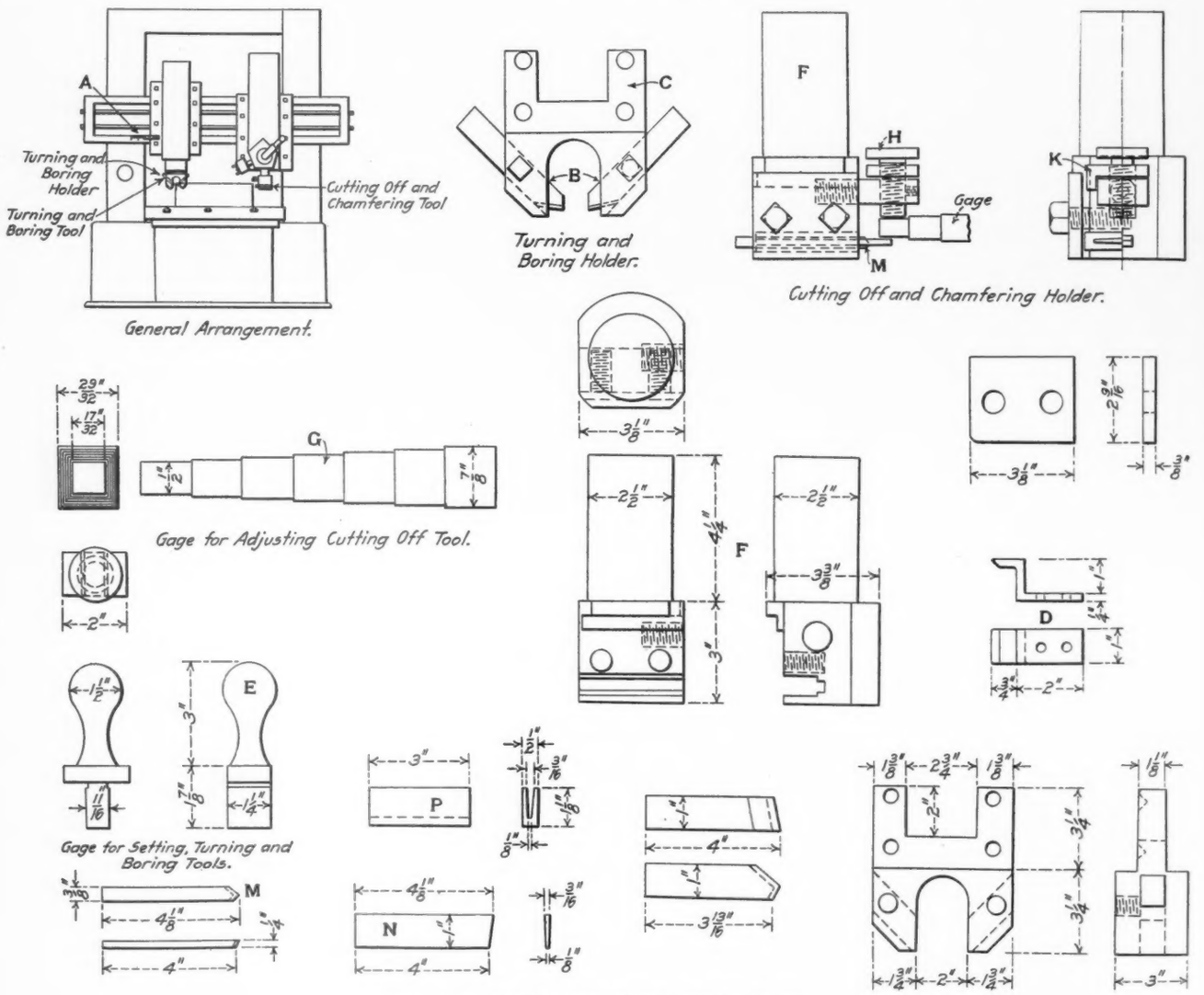


Fig. 7—Tools for Making Piston Packing Rings.

of the gage fits neatly in the opening between the two legs of the tool-holder, thus insuring the tools being adjusted to the same relative position each time.

The parting tool-holder *F* is applied to the right hand turret head of the machine. To adjust the holder to cut off a ring the required thickness the gage *G* is placed on the upper side of the tool, and the end of the screw *H* is brought to bear on the upper face of the gage. The dog, or stop, *K*, is then turned to the right until it stops and is locked to the screw *H*. While roughing the top face of the casting the left turret head is set to the desired diameter by means of the indicator *D* and the scale on the cross rail and the cut is started. A finishing cut is then taken across the top face of the casting, after which the machine is

ANGLE COCK GRINDING MACHINE.

The important features of the angle cock grinding machine, shown in Figs. 8 and 9, are its simplicity of construction and operation. The horizontal driving shaft *F* is belted direct to the line shaft, a countershaft not being necessary. The vertical spindles *A* are driven by the friction disks *B*, which have a sliding fit on a splined shaft and rotate with it. The vertical spindles are

driven singly or together, and are operated by lifting the lever *C*, which, with a slight lateral movement, will engage with the catch *D*.

This catch may be adjusted to suit the tension required between the friction disk and the spindle pulley *E* by raising or lowering the catch in the slot of the breast plate. The valve

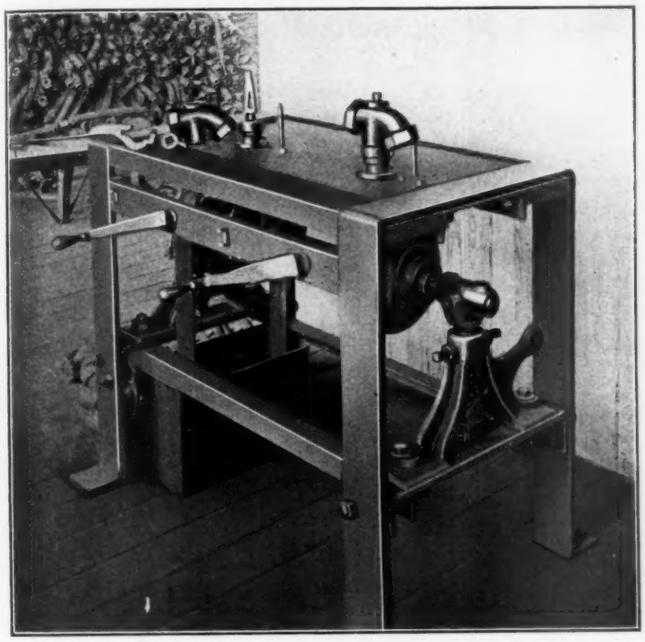
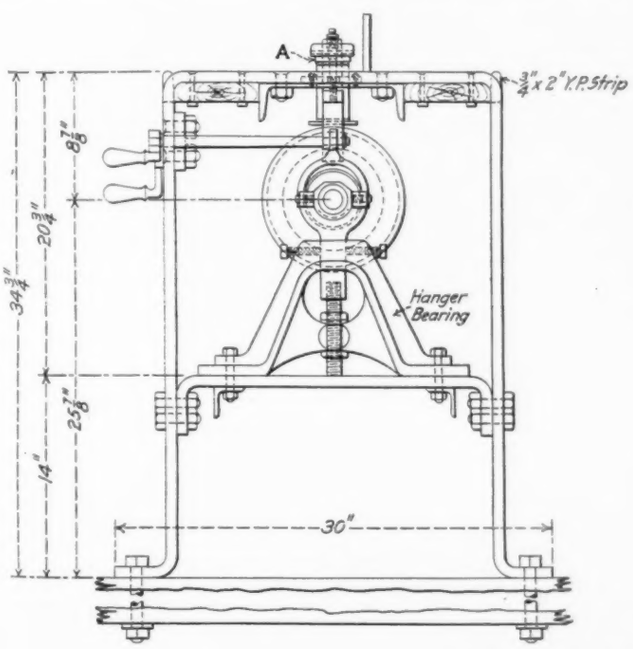


Fig. 8—Angle Cock Grinding Machine.

key or plug when screwed to the spindle stud *G* revolves with the vertical spindle. The body of the valve which rests on its key and is prevented from turning by the pin *H* is raised off its seat by the lifting collar *J* once every fifth revolution of the



spindle. This lifting of the valve body is actuated by the cam roller *K*, which strikes the steel ball upon which rests the lifting pin. The lifting pin and lifting collar are fastened to each other with a taper pin. This pin passes through the slot of the vertical spindle, thus allowing a lifting movement in the spindle during its rotation. A space of about 1/16 in. between the body of the valve and the lifting collar will allow the body of the valve to raise off its seat about ⅛ in.; this is to prevent the cutting of rings or grooves on the valve key or seat. The number of grinding spindles to a machine may be increased to suit the conditions and requirements of the shop. This machine was built entirely from forgings, except the pulley and bearings, which were found in the metal yard.

OPERATING LEVER FOR OVERHEAD STEAM VALVES.

The device shown in Fig. 10 is used for opening and closing the 1¼-in. plug valves located on the overhead steam blower line. In this case the valve is 18 ft. from the floor. The lever in engine houses has been in use for nearly 2½ years, without requiring any repairs except the repacking of the valve stems. Its construction is very simple, consisting of the lever *A*, the knocker *B*

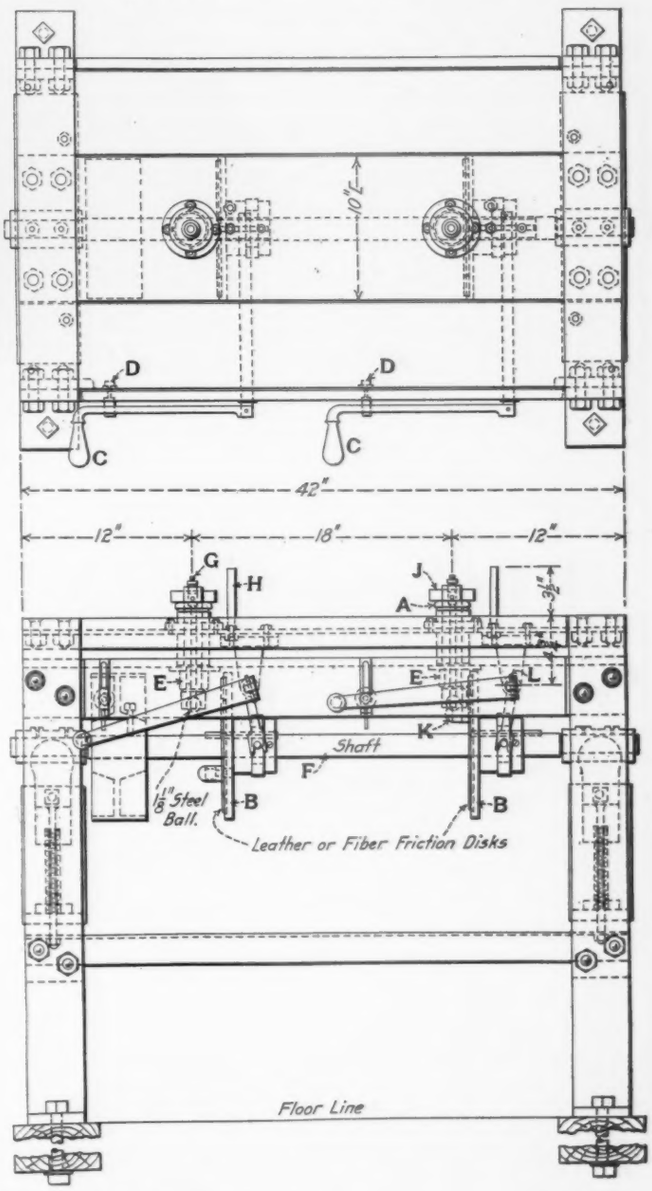


Fig. 9—Machine for Grinding Angle Cocks.

made of ½ in. x 1 in. iron, and a reach rod of ½-in. round iron, its length depending, of course, on the height of the steam line from the floor. To operate when in the closed or open position, push the reach rod up and over until the knocker *B* rests on opposite

end of the starting lever *A;* then by raising and lowering the knocker by means of the reach rod and just enough to produce a light blow on the starting lever, the movement of the valve

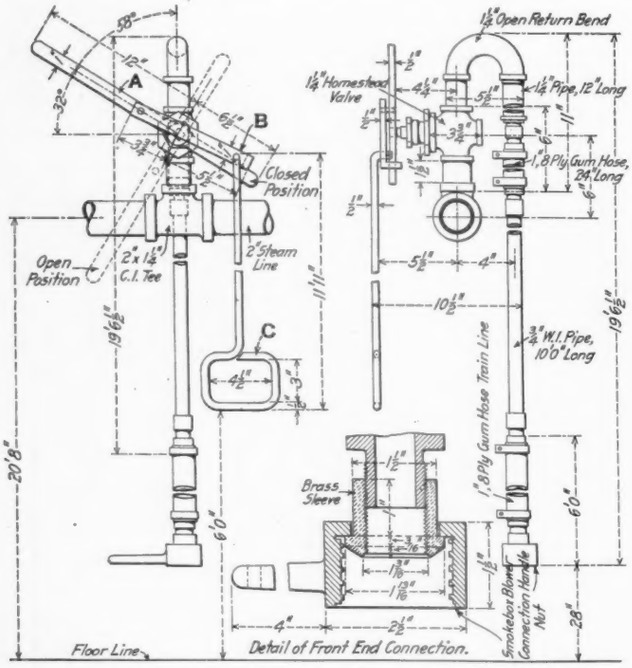

1½" Open Return Bend
1¼" Homestead Valve
1¼" Pipe, 12" Long
1, 8 Ply Gum Hose, 24" Long
Closed Position
Open Position
2" x 1½" C.I. Tee
2" Steam Line
¾" W.I. Pipe, 10'0" Long
1, 8 Ply Gum Hose Train Line
Brass Sleeve
Smokebox Blower Connection Hook Nut
Floor Line
Detail of Front End Connection.

Fig. 10—Device for Operating Overhead Plug Valves.

is very easily accomplished without any excessive strain on the valve outfittings.

RECLAIMING CROSSHEAD SHOES.

Crosshead shoes that have become worn at *D* (Fig. 11), due to the lateral movement of the shoe on its center while in service are closed to the standard width by the use of the device shown

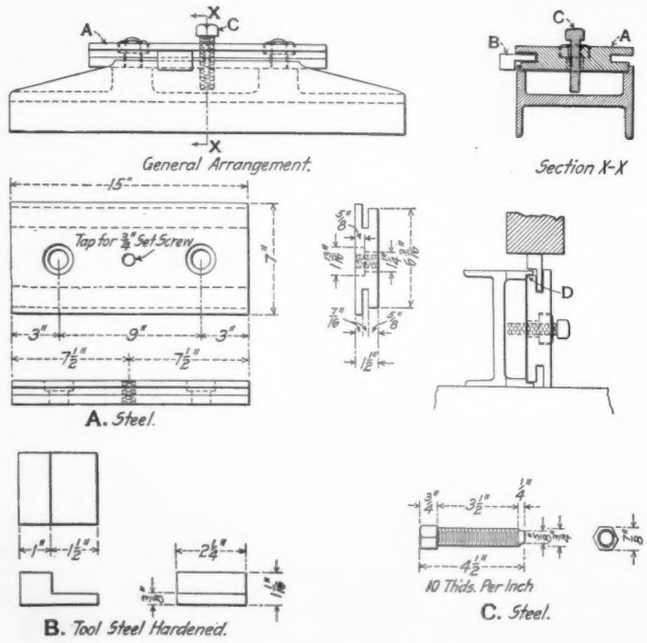


Fig. 11—Device for Reclaiming Crosshead Shoes.

in Fig. 11. A plate *A* is bolted to the back of the shoe by means of the shoe bolts. The shoe is then set on its side under a press. The L-shaped piece *B*, which is made an easy sliding fit in the groove of the plate *A*, is then forced down on the lip of the shoe, closing the entire length of the shoe lip at one operation. The same operation is then performed on the other side of shoe. The plate *A* is taken off of the shoe after removing the nuts of shoe bolts, by screwing the set screw *C* against the back of shoe. Shoes of this type having as much as 3/32 in. lateral wear can be closed to the standard width at a lower cost and will give better results than by the application of liners.

LOCOMOTIVE PAINTING.*

BY N. J. WATTS,
Foreman Engine Painter, Nashville, Chattanooga & St. Louis, Nashville, Tenn.

Present conditions require that the old practice of painting locomotives must be abandoned and some quicker method adopted. The painter is supposed to have his work completed by the time the engine is assembled and no delay is tolerated.

We have, therefore, adopted a seven day system, as follows:

First: Remove the old paint when necessary with some good paint remover, following it up with one coat of a good steel primer.
Second: One coat of rough stuff.
Third: Two coats of rough stuff.
Fourth: Glaze all over with a good lead putty.
Fifth: Rub with emery cloth and linseed oil; wipe dry and coat with drop black.
Sixth: Letter, number and varnish.
Seventh: Put on a coat of finishing varnish.

This system applies to tanks, steel cabs, steam domes and sand boxes, the rest of the engine being painted with a good engine black. The painting of locomotives is handled differently from that of passenger cars, for in the case of cars all the repairs are supposed to be made before the car goes into the paint shop. This gives the painter a clear field for his work. The engine painter has the machinists, boiler makers, pipe fitters and carpenters to contend with, but nevertheless he is supposed to have the engine painted on time. Because of all these interruptions he should have the support of the general foreman in making his work as easy as possible.

The foreman painter should have his force well organized, and should allot to each man that part of the work in which he is most efficient. He should be most careful in selecting his men, as one bad one often tends to spoil the entire organization. The best policy is to hire young men to do the cleaning and advance them as the opportunity presents. The young men become interested as soon as they have something better to look forward to. Give them each a chance as his turn comes, and if he does not make good take the next one. Often a good man may be found among those doing the rough work and by advancing him much better results may be obtained. Create harmony and good feeling among your men.

The following is a record of the work done during the month of January, 1911, with a force of 15 men. The painting work on the passenger engines was cleaned with an oil cleaner and all the necessary blacking was done.

Passenger engines cleaned and paint touched up	40
Engines repaired in the engine house	21
Engines overhauled in the back shop	19

This makes a total of 80 engines handled in one month, and does not include the running repairs, such as headlight glasses, cab glasses, etc. The report is given to show what one shop is doing, and if a better record is made elsewhere the writer would be glad to know how it is done.

Iron and Steel Exports.—Figures compiled by the bureau of statistics, Department of Commerce and Labor, show that the United States follows England and Germany in the tonnage of iron and steel exports. The progress of the United States in that branch of commerce has been rapid, total exports of steel having increased from $103,000,000 in 1901 to nearly $250,000,000 in 1911. In the last ten years the United States has exported $1,500,000,000 of iron and steel.

*Entered in the *Railway Age Gazette* competition on Paint Shop Practice which closed November 15, 1911.

LONG ISLAND ALL-STEEL PARLOR CARS

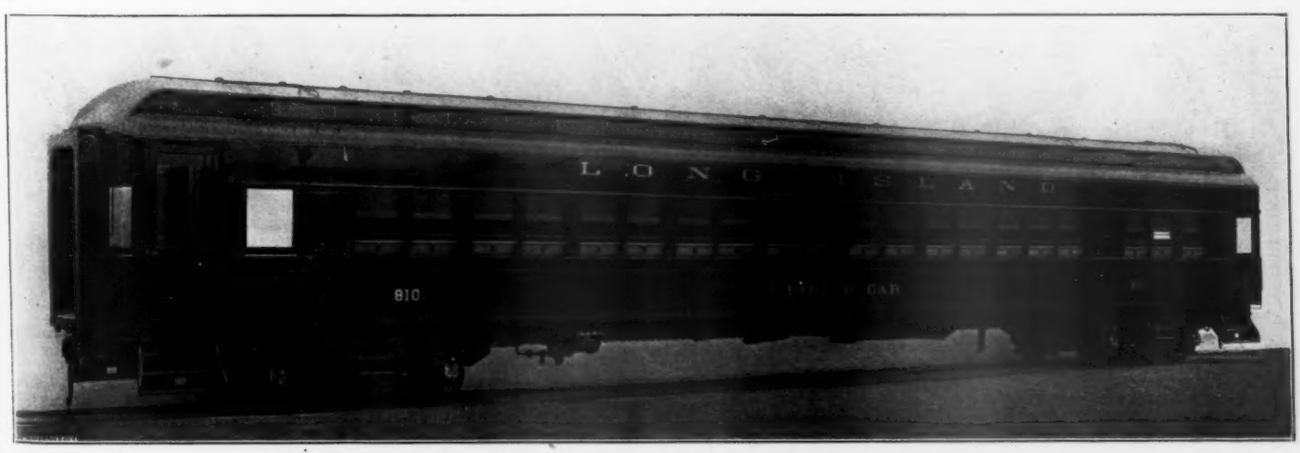
On a railway like the Long Island where there is a large amount of high-class passenger traffic on comparatively short hauls, especially during the summer months, attractive parlor car equipment is an important part of the rolling stock. Recently in ordering new cars of this type the company used the framing of the standard Pennsylvania P-70 all-steel coach as the basis of what has proved to be very commodious and attractive parlor cars, of which ten have been built by the American Car & Foundry Company. The structural part of these cars has been very fully described and illustrated in these columns.* They are 70 ft. 5¼ in. long over the body corner posts, and have been arranged for 26 chairs, a drawing room with a sofa and two movable chairs, a smoking room with five wicker chairs, or a total of 36 seats in addition to two toilets and the necessary lockers, etc.

Extreme Simplicity Governs the Interior Finish.

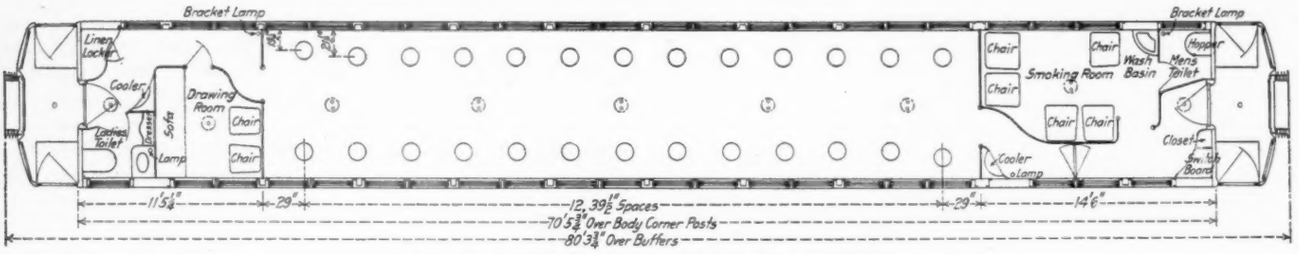
Extreme simplicity has been the keynote of the design in the interior, and the flatness of the surfaces has been relieved with small moldings only. Commodious racks of a square box design in keeping with the rest of the car have been provided in place of hooks. The only sign of ornamentation in the interior is found in the door posts and caps at either end and this, as may be seen in the illustration, is severely simple in its treatment. The interior is finished in a steel grey tone, being relieved with narrow gold stripping and a fine red line in the panels. The lower deck is of slightly darker shade than the side. Special care has been given in the interior to get smooth surfaces and nicely rounded corners at the junction of all of the

General Interior View of Steel Parlor Car.

*See *American Engineer & Railroad Journal*, June, 1907, page 232.



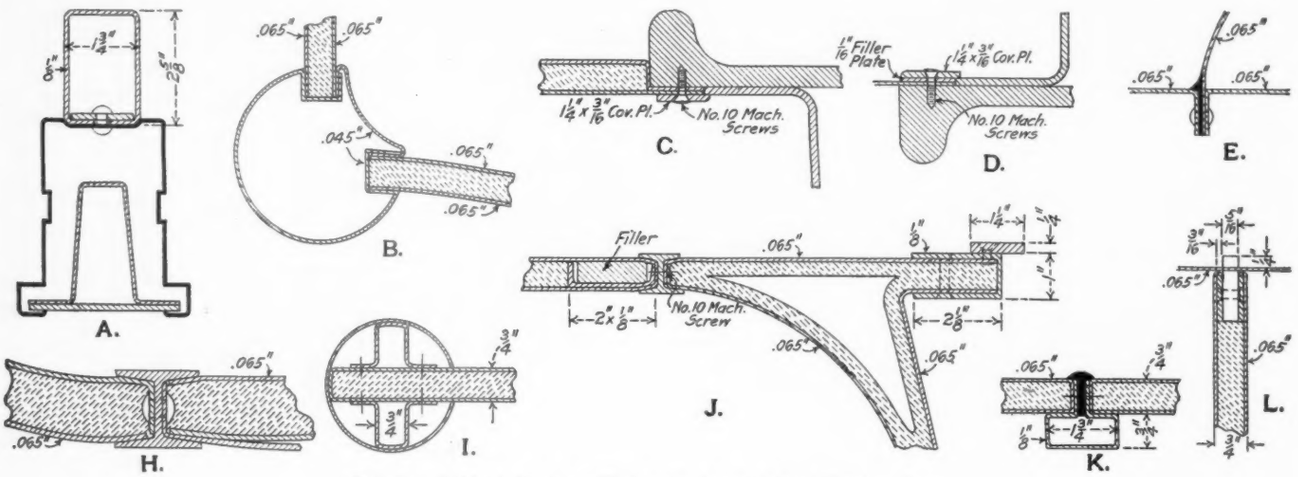
Seventy-Foot Steel Parlor Car; Long Island.



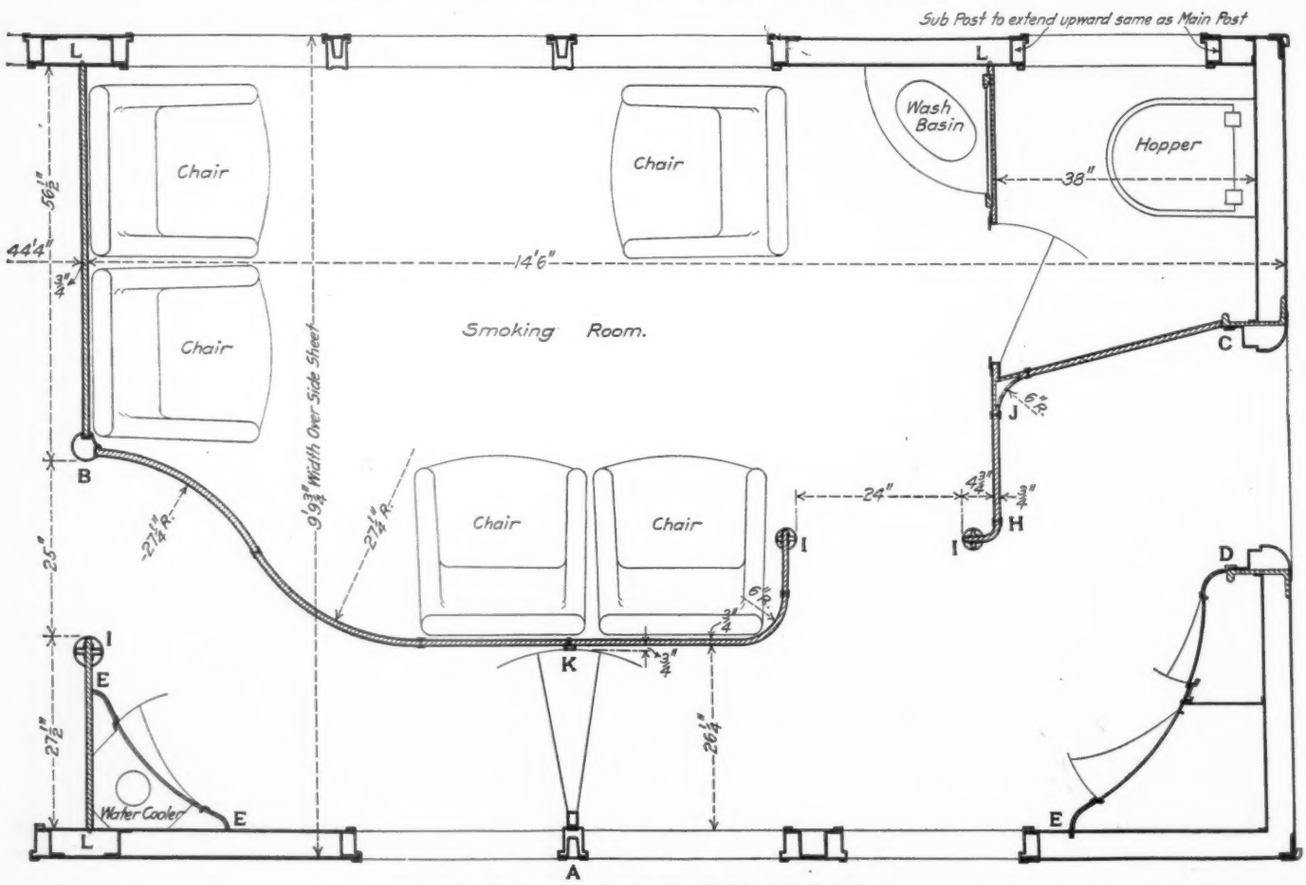
Floor Plan of 70-Ft. Steel Parlor Car; Long Island.

steel plates. The way in which this has been done is clearly shown in the detailed illustrations at the various junctions. The use of chairs with mahogany frames and rattan seats and backs with the green Wilton carpet and the light finish makes this car especially attractive for summer traffic.

Electric lighting is furnished by an axle lighting system, and several electric fans are provided. The cars are also equipped with steam heat, arrangement being made so that the system is divided into four parts, any combination of which can be put into use as required. Four-wheel trucks of the standard Pennsyl-



Details of Steel Interior Finish in Long Island Parlor Cars.



Plan of Smoking Room End of Steel Parlor Car.

vania type for this class of car, with the exception that they have an 8 ft. 6 in. wheel base and 5½ x 10 in. journals in place of a 7 ft. 1¼ in. wheel base, and 5 x 9 in. journals, have been used. The cars have a total weight of 124,000 lbs.

RECLAIMING CAR DEPARTMENT SCRAP*

BY C. L. A.

Scrap, as usually considered from a car department standpoint, is any and every class of material found on the right of way, taken from repaired cars and not used again on the car, or from wrecked or demolished cars. It is usually delivered, or should be, to a central reclamation and shipping or storage point for disposition.

Not all "scrap" is really scrap. In this heterogeneous mass is much that is fit for further use on the road without alteration or change of any kind; it is good second-hand material and ready for use again without further cost save distribution to the shops or repair tracks. All materials of this class should be reclaimed. It includes couplers, followers, springs, brake beams, journal bearings, wheels, axles and other articles too numerous to mention. There are also bent parts, such as brake beams, coupler bodies, connections, plates, followers, pockets, bolts, center pins, etc., that it is profitable to straighten and use again. Straight rods can be cut to shorter lengths, and be made into bolts, brake beam hangers, etc.

Old nuts and bolts can be recut when not too badly rusted; flat iron can be cut to short lengths for plates and for other uses. Brake beams with heads, fulcrums, compression rods, etc., broken can be fitted up again with profit. Journal bearings can be rebabbitted and used again; bolts can be cut to shorter lengths and threaded, and a discriminating man can reclaim certain material standard to foreign cars that he knows will in all likelihood be required for repairs. The man who knows just about what will be needed in a reasonable time is your true "efficiency engineer," and has got them all "skinned a mile" to use the prevailing parlance among railway men.

The reclaiming of scrap, however, can be carried too far. When any single item or part costs more to reclaim than new material delivered, then it is not only unprofitable but foolish. It is a wise man that reclaims material at a cost between scrap value and new material cost, and the margin demands the closest attention and foresight. For instance take a bent rod to be converted into bolts; it is carried to the fire where coal and labor are used to straighten it and is left to cool. It is handled again to cut to length for the header, is heated again, requiring more fuel and labor and is left to cool, after which it is threaded by bolt cutter. If it has cost more than bolts can be bought for in open market then the transaction is unprofitable.

This rule holds good on any operation involved in reclaiming scrap. It should be the policy of the supervisor to "count the cost," add this to market price of the particular class of scrap and compare it with market price of the article in question, whether it be bolts, nuts, commercial iron or what not.

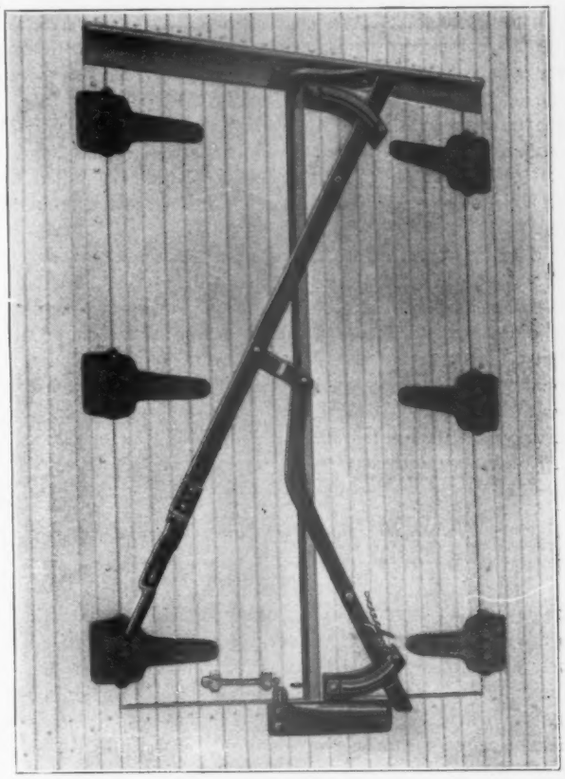
This does not necessarily involve the services of a so-called efficiency engineer. It does require a bright, thorough, experienced foreman who is familiar with the needs and requirements of the company by whom he is employed. All "scrap" is not scrap, nor is all reclaimed material necessarily an asset, although it should be.

PENNSYLVANIA STEEL CARS.—There are now in service on the Pennsylvania Lines East 588 steel coaches, 58 steel dining cars, 99 steel passenger and baggage cars, 78 steel baggage cars, 94 steel postal cars and 710 steel Pullman cars. In addition, there are being built 251 steel coaches, 31 steel passenger and baggage cars and 194 steel Pullman cars.

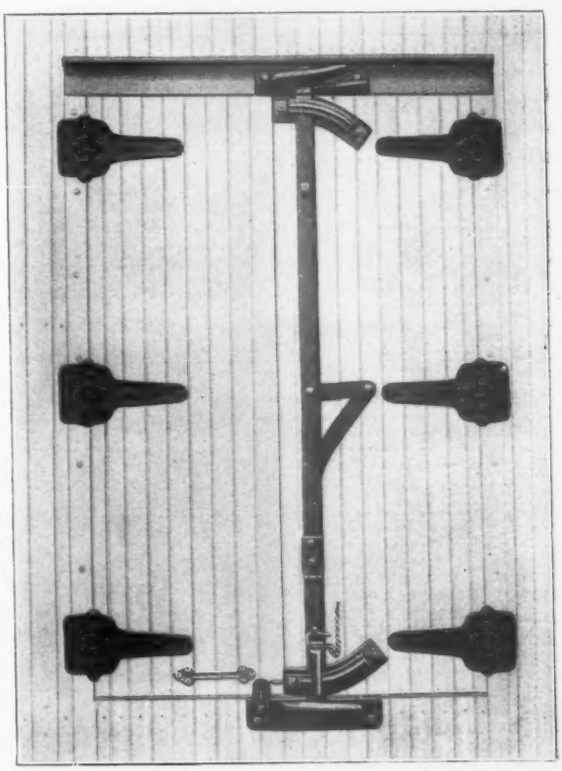
*Entered in the competition, which closed February 15, 1912.

REFRIGERATOR CAR DOOR FIXTURES

The railways pay claims to a considerable amount for damage caused by not having refrigerator car doors tightly closed and the expense of repairs to the car itself due to missue in opening doors which are stuck, make it desirable to have some device whereby these operations can be satisfactorily performed. To



Levers of Door Opening and Closing Device in Open Position.



Refrigerator Car Door Closed and Ready for Sealing.

fulfill this need the Garland refrigerator car door closing and opening device has been designed and has proved most satisfactory.

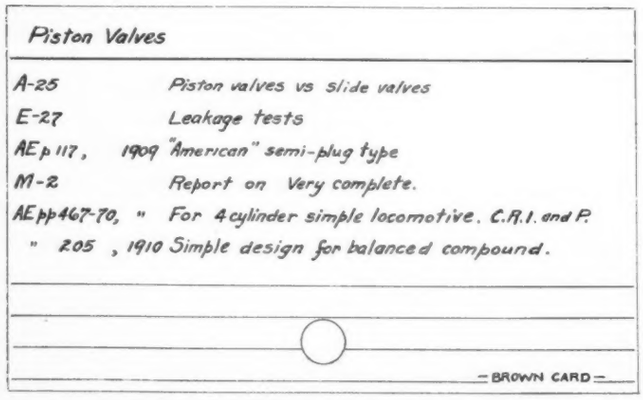
The appliance consists of two operating levers, one pivoted near the top and the other pivoted near the bottom of the door and connected by a link at the center. Each of the levers extends about 3 in. beyond the door, the extension being formed into a wedge. Bolted to the framing above the door and to the sill below it are keeper castings with beveled lugs for receiving the lever wedges. A locking handle is hinged to the upper lever and closes over a staple on the lower lever, permitting it to be sealed in the usual way. Guides hold the levers in place at the ends. The arrangement is such that when the doors are closed the levers will engage the keeper castings when the right hand door is still open 3 or 4 in.; then when the handle is pulled to the right, the incline in the keeper casting will force the door tightly closed.

In opening, the inclined faces of the keeper castings force the door outward when the operating handle is pulled to the left. The keeper castings are extended inward under the threshold plate and across the door frame and each terminates in a lug that prevents the left door from being forced inward. Pivoted to the base of the lower keeper casting is a holder to prevent the left door bulging out when the right door is being opened. This device is made and sold by Burton W. Mudge & Co., of Chicago, Ill.

A SIMPLE CARD INDEX

BY R. S. MOUNCE.

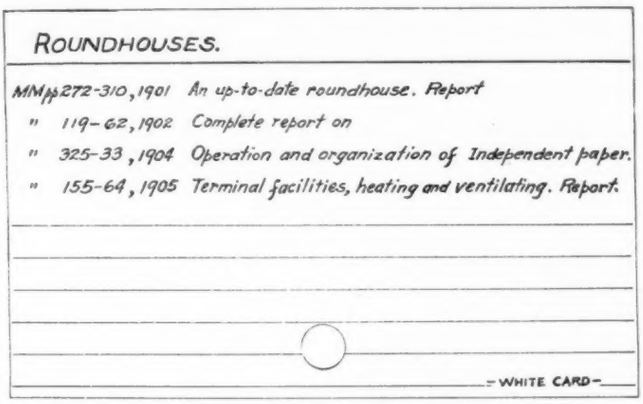
The system of card indexing outlined below is one that has been used by the writer for several years and has proved to be entirely satisfactory. By its use all literature of every sort that one may accumulate, bearing on some branch or branches of engineering, may be easily indexed without the omission of any details, provided the articles are suitably cross-indexed. Its advantage lies in its simplicity and in its elasticity. The following


Piston Valves
A-25 Piston valves vs slide valves
E-27 Leakage tests
AE p 117, 1909 "American" semi-plug type
M-2 Report on Very complete.
AE pp 467-70, " For 4 cylinder simple locomotive. C.R.I. and P.
" 205 , 1910 Simple design for balanced compound.
BROWN CARD

Arrangement of Index Card for References to Periodicals, Pamphlets and Clippings.

description refers to railway mechanical literature, but it would apply equally well to other subjects. Two different colors of index cards are used, a white and a light yellowish brown. The white cards are used for indexing text books, proceedings of engineering societies and other similar books, and have the titles printed on them in block type, whereas the brown cards have the titles printed in small type and refer to periodicals, pamphlets and clippings.

As far as is consistent each reference is limited to one line. Periodicals, pamphlets, proceedings and the like are indicated by suitable characters. For example: a reference to the *American Engineer* would show the page and year, as follows, "AE pp. 71-4, 1911;" and the same would hold in the case of the Master Mechanics Proceedings, as MM pp. 95-105, 1905. Pamphlets are lettered and numbered, *Pf 1, Pf 2,* etc., and are so shown on the index cards. Clippings are filed in envelopes (4 in. x 9½ in.), each bearing a letter. Each clipping is numbered and has the letter corresponding to the envelope containing it. For example, the fourth clipping in envelope *D* would be marked *"D-4,"* and would be so shown on the index card under its proper title. When 26 envelopes have been filled, another set may be started by placing a numeral before the letter, as for

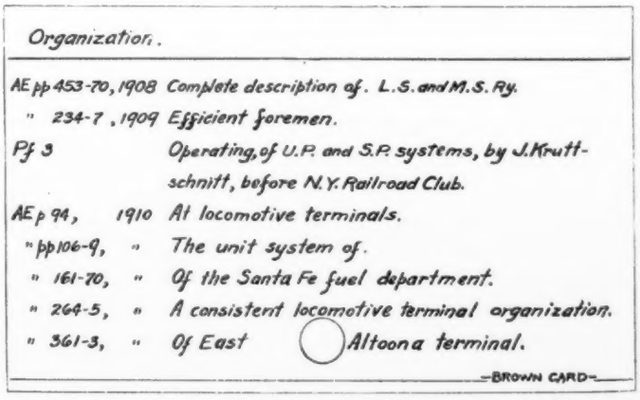

ROUNDHOUSES.
MM pp 272-310, 1901 An up-to-date roundhouse. Report
" 119-62, 1902 Complete report on
" 325-33, 1904 Operation and organization of Independent paper.
" 155-64, 1905 Terminal facilities, heating and ventilating. Report.
WHITE CARD

Arrangement of Card Used for Indexing Text Books and Proceedings of Engineering Societies.

instance, *2A* to *2Z*, *3A* to *3Z*, etc. As this may be done indefinitely, it places no limit upon the number of clippings which may be cared for by this system. The sample cards, shown herewith, indicate clearly the application of the foregoing explanation.

If it is desired to locate a certain article, which is known to be in a periodical, one has only to choose a title to fit the article (and if the cross-indexing has been carefully done the reference is easily found), to look for that title on a brown card, and then to look over the card until the desired subject is found. After a few years the number of references on some subjects will be so large that the advantage of using two sets of cards, which will separate the periodicals from the books, will be very evident.

The great value of this card index system, if properly carried out, lies in the fact that all of one's engineering literature is placed within easy reach. Nor does this system take any account of time, for it covers everything which may be accumulated in the


Organization.
AE pp 453-70, 1908 Complete description of. L.S. and M.S. Ry.
" 234-7, 1909 Efficient foremen.
Pf 3 Operating, of U.P. and S.P. systems, by J. Kruttschnitt, before N.Y. Railroad Club.
AE p 94, 1910 At locomotive terminals.
" pp 106-9, " The unit system of.
" 161-70, " Of the Santa Fe fuel department.
" 264-5, " A consistent locomotive terminal organization.
" 361-3, " Of East Altoona terminal.
BROWN CARD

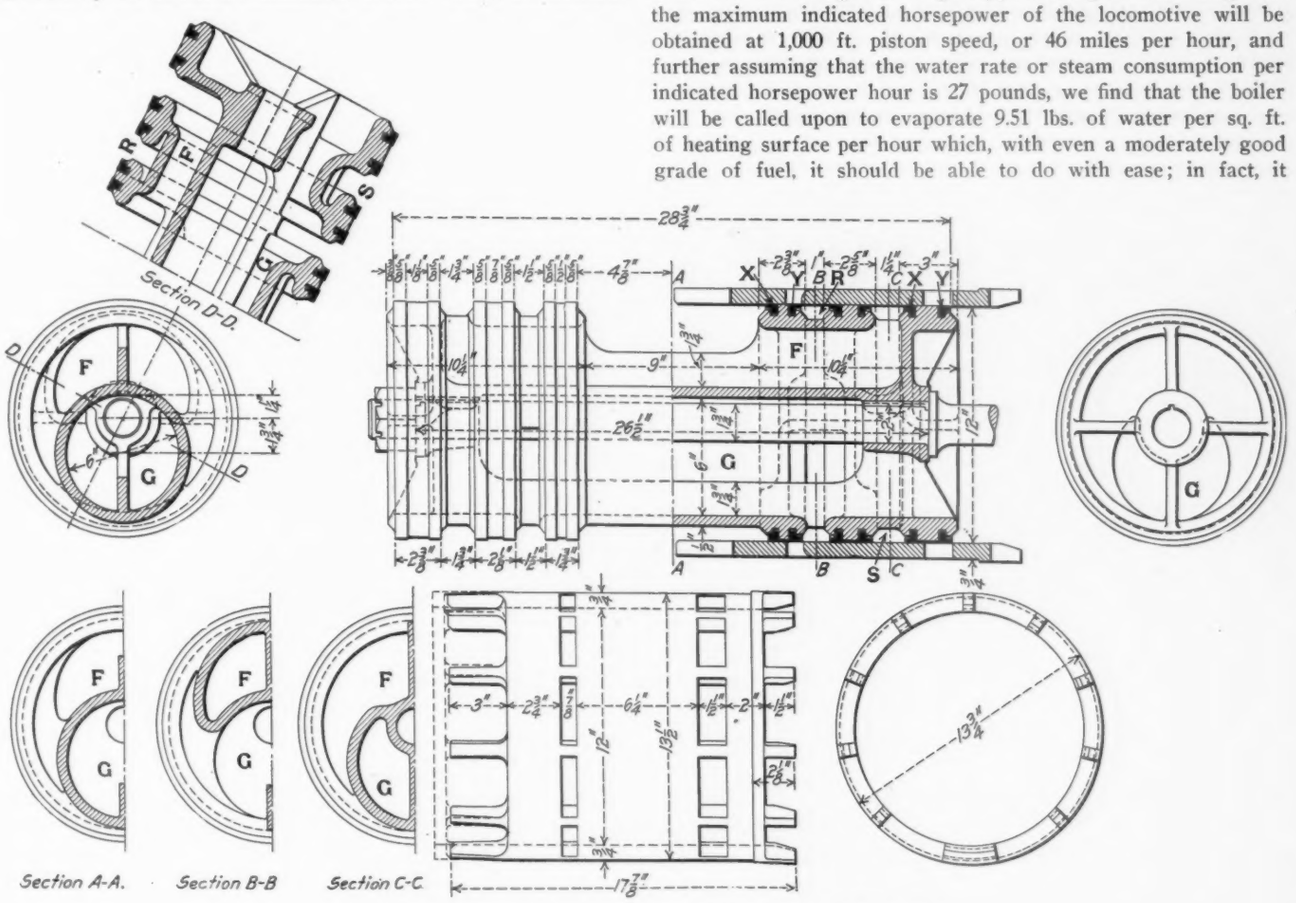
Sample Index Card from Periodical, Pamphlet and Clipping File.

period during which it is kept. Indices in each year's periodicals, or in the backs of books are valuable, where there are but a few of them; but in order to keep track of a large quantity of books and magazines, a simple and efficient card index system becomes imperative and will pay many times over for the trouble of keeping it up, if not carried too far.

PACIFIC TYPE LOCOMOTIVES

Nashville, Chattanooga & St. Louis.

Three locomotives of the 4-6-2 type, designed to handle passenger trains between Nashville, Tenn., and Chattanooga, have recently been delivered to the Nashville, Chattanooga & St. Louis by the Baldwin Locomotive Works. These locomotives

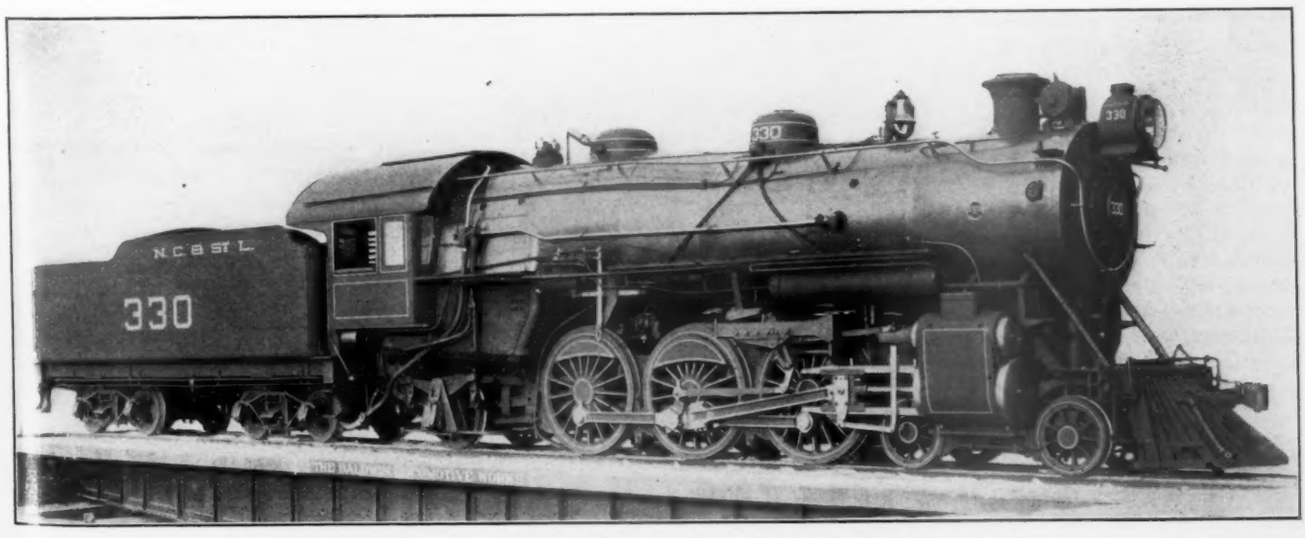


Double Ported Piston Valve and Bushing for a Simple Engine.

are intended to cover the distance of 151 miles in four hours and 17 minutes, including six stops, with a 12-car train. The hilly nature of the country makes this a very severe schedule requiring a locomotive of considerable reserve power.

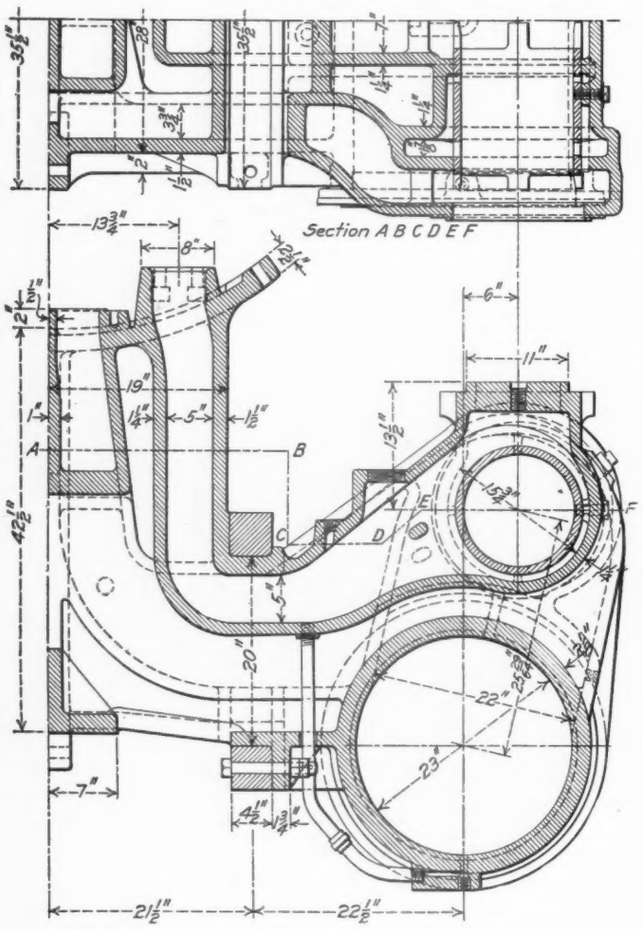
An inspection of the illustration and the table of dimensions shows these locomotives to be about the same general size as locomotives built for a number of railways in the past 5 or 6 years. The heating surface when compared with the weight and tractive effort is somewhat larger than is customary and has been obtained by the use of 440 2 in. tubes, 20 ft. 6 in. in length, which are so arranged as to give 7/8 in. bridges. Assuming that the maximum indicated horsepower of the locomotive will be obtained at 1,000 ft. piston speed, or 46 miles per hour, and further assuming that the water rate or steam consumption per indicated horsepower hour is 27 pounds, we find that the boiler will be called upon to evaporate 9.51 lbs. of water per sq. ft. of heating surface per hour which, with even a moderately good grade of fuel, it should be able to do with ease; in fact, it should be able to do considerably better than this and the indications are that the locomotives have ample steam making capacity.

While in general the locomotives follow the usual practice and



Powerful Pacific Type Locomotive for the Nashville, Chattanooga & St. Louis.

customary construction for their size and type, a decided novelty is found in the use of a double ported piston valve, a construction seldom, if ever, before used on a simple engine. This valve is 12 in. in diameter and is believed to have all the advantages of the large admission and exhaust passages possessed by a much larger valve. Its construction is clearly shown in the illustration where it will be seen that the valve body is formed with two longitudinal passages, *F* and *G*. Passage *F* is open to the valve chest at the center and is closed at the ends, while passage *G* is open at the ends, but has no communication to the live steam passage in the center. The passage *G* is circular in shape but is arranged eccentric with the valve stem while passage *F* is in a crescent shape around *G*. The bushing is arranged with two sets of ports; the one nearest the end is 1½ in. in width and the other is ⅞ in. in width. The admission



Cylinders for Use With Double Ported Piston Valve.

of the live steam in passage *F* to the ports is controlled by packing rings *X*, while the rings *Y* control the exhaust, the steam escaping partially through the passage *G*. The rings are so arranged that the admission or exhaust from both ports occur simultaneously. It will be seen that both the admission and exhaust take place throughout the whole circle of the bushing since the channel passages *S* and *R* communicate to the admission and exhaust chambers, respectively. The valves are arranged for a steam lap of one inch and exhaust clearance of ⅛ in. and are set with a lead of ¼ in. They are operated by Walschaert valve gear which is provided with Ragonet power reverse gear. Application has been made for patents on certain features of this construction.

In connection with the valve gear, it will be noted that the guides for the valve stem crosshead are on a bracket formed on the back steam chest head, a construction which has many advantages and is now coming into quite general use. Close attention has been given to frame bracing in this design and transverse steel castings bolted to both the upper and lower rails of the frame are found between each pair of driving wheels in addition to the braces at the guide yoke and fire box support.

The general dimensions, weights and ratios are given in the following table:

General Data.

Gage	4 ft. 8½ in.
Service	Passenger
Fuel	Bit. coal
Tractive effort	35,000 lbs.
Weight in working order	253,550 lbs.
Weight on drivers	157,250 lbs.
Weight on leading truck	51,650 lbs.
Weight on trailing truck	44,650 lbs.
Weight of engine and tender in working order	410,000 lbs.
Wheel base, driving	13 ft.
Wheel base, total	34 ft. 1 in.
Wheel base, engine and tender	67 ft. 10 in.

Ratios.

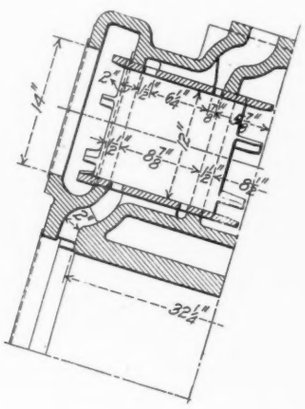
Weight on drivers ÷ tractive effort	4.48
Total weight ÷ tractive effort	7.23
Tractive effort × diam. drivers ÷ heating surface	505.00
Total heating surface ÷ grate area	76.00
Firebox heating surface ÷ total heating surface, per cent	5.62
Weight on drivers ÷ total heating surface	31.60
Total weight ÷ total heating surface	50.90
Volume both cylinders, cu. ft.	13.50
Total heating surface ÷ vol. cylinders	368.00
Grate area ÷ vol. cylinders	4.93

Cylinders.

Kind	Simple
Diameter and stroke	23 in. x 28 in.

Valves.

Kind	Double ported piston
Diameter	12 in.
Greatest travel	6 in.
Outside lap	1 in.



Part-Section Through Piston Valve Chamber and Cylinder.

Inside clearance	⅛ in.
Lead	¼ in.

Wheels.

Driving, diameter over tires	72 in.
Driving, thickness of tires	4 in.
Driving journals, main, diameter and length	10½ in. x 12 in.
Driving journals, others, diameter and length	9½ in. x 12 in.
Engine truck wheels, diameter	36 in.
Engine truck, journals	6 in. x 12 in.
Trailing truck wheels, diameter	44 in.
Trailing truck, journals	8 in. x 14 in.

Boiler.

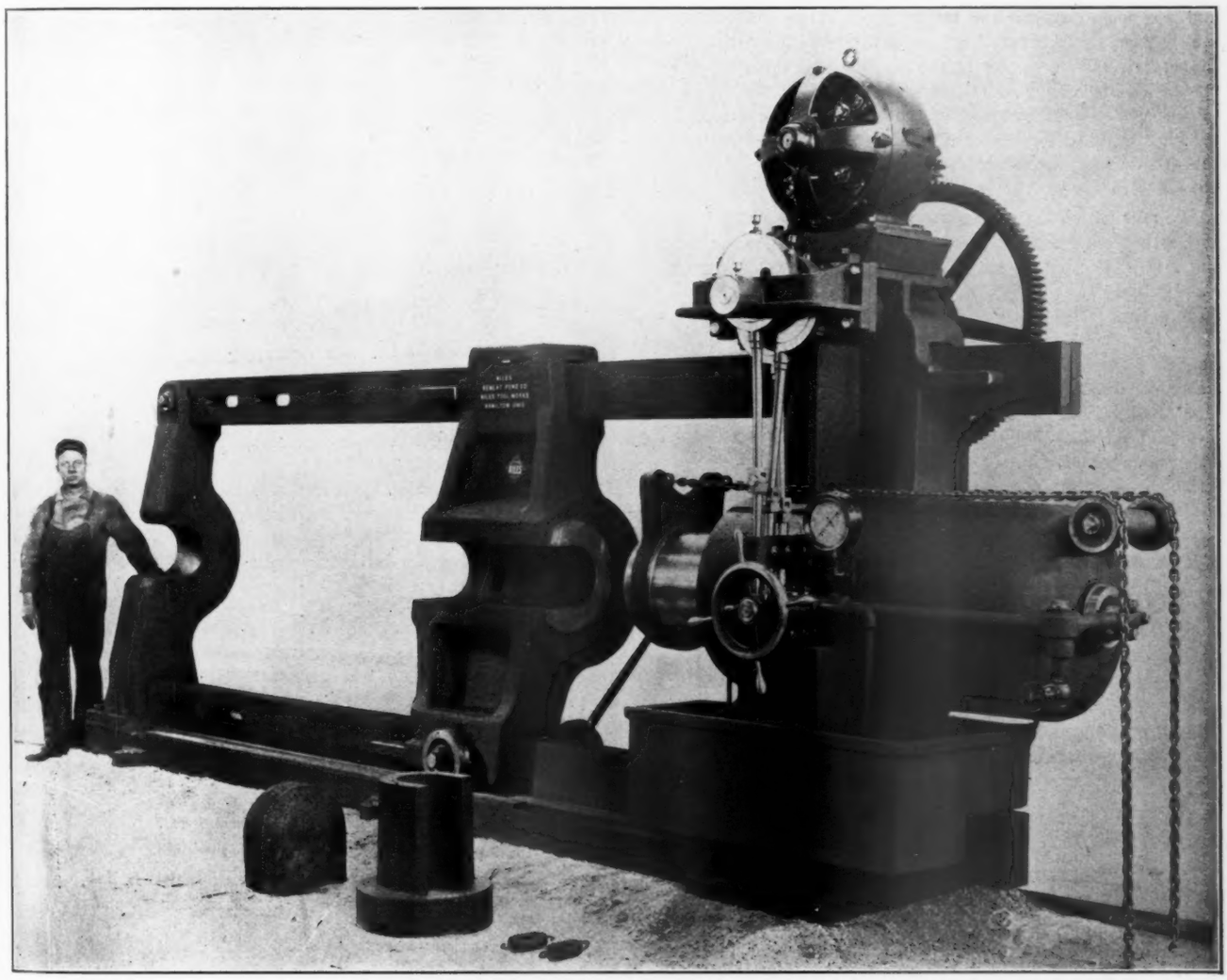
Style	Wagon top
Working pressure	200 lbs.
Outside diameter of first ring	76 in.
Firebox, length and width	114⅛ in. x 84¼ in.
Firebox plates, thickness	⅜ in. and ½ in.
Firebox, water space	5 in.
Tubes, number and outside diameter	440—2 in.
Tubes, length	20 ft. 6 in.
Heating surface, tubes	4,703 sq. ft.
Heating surface, firebox	280 sq. ft.
Heating surface, total	4,983 sq. ft.
Grate area	66.7 sq. ft.

Tender.

Wheels, diameter	36 in.
Journals, diameter and length	5½ in. x 10 in.
Water capacity	8,500 gals.
Coal capacity	14 tons

600-TON CAR WHEEL PRESS

In the accompanying illustration is shown an unusually heavy press for car wheel work recently built by the Niles-Bement-Pond Co. The general design of the press is similar to that of the Niles standard machines regularly made for car wheel work up to 400 tons capacity. The 600-ton press, however, has four tie bars, two at the top and two at the bottom, instead of two as in the standard machines. It is built with a steel cylinder and steel resistance head, the latter being inclined from the vertical so as to facilitate placing and removing wheels by means of an overhead crane. The press is equipped with a three-plunger pump, the construction being such that any one or all of the plungers may be thrown into or out of action independently. On the back of the cylinder is a safety valve which can be set to open when the pressure reaches the capacity of the machine. The pressure gage furnished is graduated in total tons pressure on the ram as well as in pounds pressure per sq. in. The ram is counter-weighted for quick return and provision can be made for connecting the cylinder direct to the shop water mains for the rapid advance of the ram. The machine is driven by a 15 h. p. constant speed motor mounted on top of the cylinder casting and geared direct to the pump shaft. It is designed for handling standard car wheels up to 42 in. in diameter on the tread and of standard gage.



Forty-Eight Inch 600-Ton Niles Wheel Press.

GYRUS SPARK ARRESTER FOR LIGNITE

In the western sections of Nebraska, Wyoming and Colorado the cost of a good grade of coal is very high, amounting in certain sections on the Chicago & North Western to $5.20 per ton for Iowa coal. There are large deposits of lignite in this region, however, which may be obtained at a comparatively reasonable cost, and all of the roads in that vicinity are anxious to use this fuel if possible. One of the greatest difficulties in burning lignite is the throwing of large quantities of fire from the stack. The live sparks being very light in weight are often carried some distance and form a sufficiently great fire risk to largely prevent the use of this fuel on locomotives.

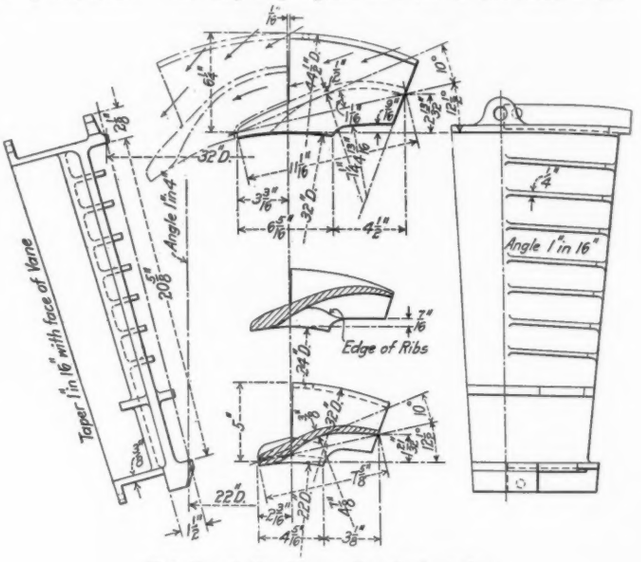
On the lines of the Chicago & North Western passing through this territory there are now 21 Pacific type locomotives equipped with a special design of spark arrester that is successfully burning lignite with the minimum of fire risk. This spark arrester has been developed by the American Locomotive Company in co-operation with the railway, and is the result of a long series of very careful experiments. The locomotives have 20 in. x 26 in. cylinders, a grate area of 46.45 sq. ft., 63-in. drivers, and a total heating surface of 2119.7 sq. ft.

The arrangement of the apparatus in the front end, which has been designed with the idea of holding the sparks in the smoke-box as long as possible, and continually baffling them until they

are ground fine and completely extinguished, in the illustration is shown. The path of the live sparks, after passing out from under the diaphragm plate, is upward along the door and its ring, then back toward the flue sheet across the top past the stack extension and then downward and forward into the exhaust. Some of them of course drop down across the top of the diaphram plate and again pass into the current. Surrounding the exhaust nozzle is a series of vanes arranged in the shape of a truncated cone with the small end downward and connecting to an extension of the stack at the top. These vanes are so shaped and arranged as to compel the incoming gases and sparks to take a circular path. The sparks after reaching the inside of the gyrus are of course thrown outward by centrifugal force and are beaten against the inside edges of the vanes until they are reduced to powder and completely extinguished, in which shape they will be caught in the exhaust and thrown out of the stack. About one-quarter of the lower end of the gyrus is cut off by a horizontal web and the sparks entering this section are drawn inward to the center of the annular exhaust and are discharged through the center of the stream, the action, however, being the same as with those entering above.

The annulus of the exhaust nozzle, the tip of which is slightly above the center line of the front end is 8 in. outside diameter and 7 in. inside diameter, giving about the same net area of discharge as a nozzle 5½ in. in diameter. The exhaust nozzle supports a cast iron base for the gyrus. Resting on this are the 16 vanes, 20⅝ in. long that are secured at their upper ends by a cast iron ring fastened to the stack extension. The shape and general construction of these vanes is shown in one of the illustrations, and it will be seen that on the outer surface there are seven curved ribs which compel the entering current to assume a nearly horizontal direction, and thus increase the centrifugal action on the interior after they pass through the vanes.

The bottom of the smokebox is covered with fire brick, and there is a 3/16-in. sheet iron jacket protecting the front end ring and door. The diaphragm plate in front of the flues is cov-

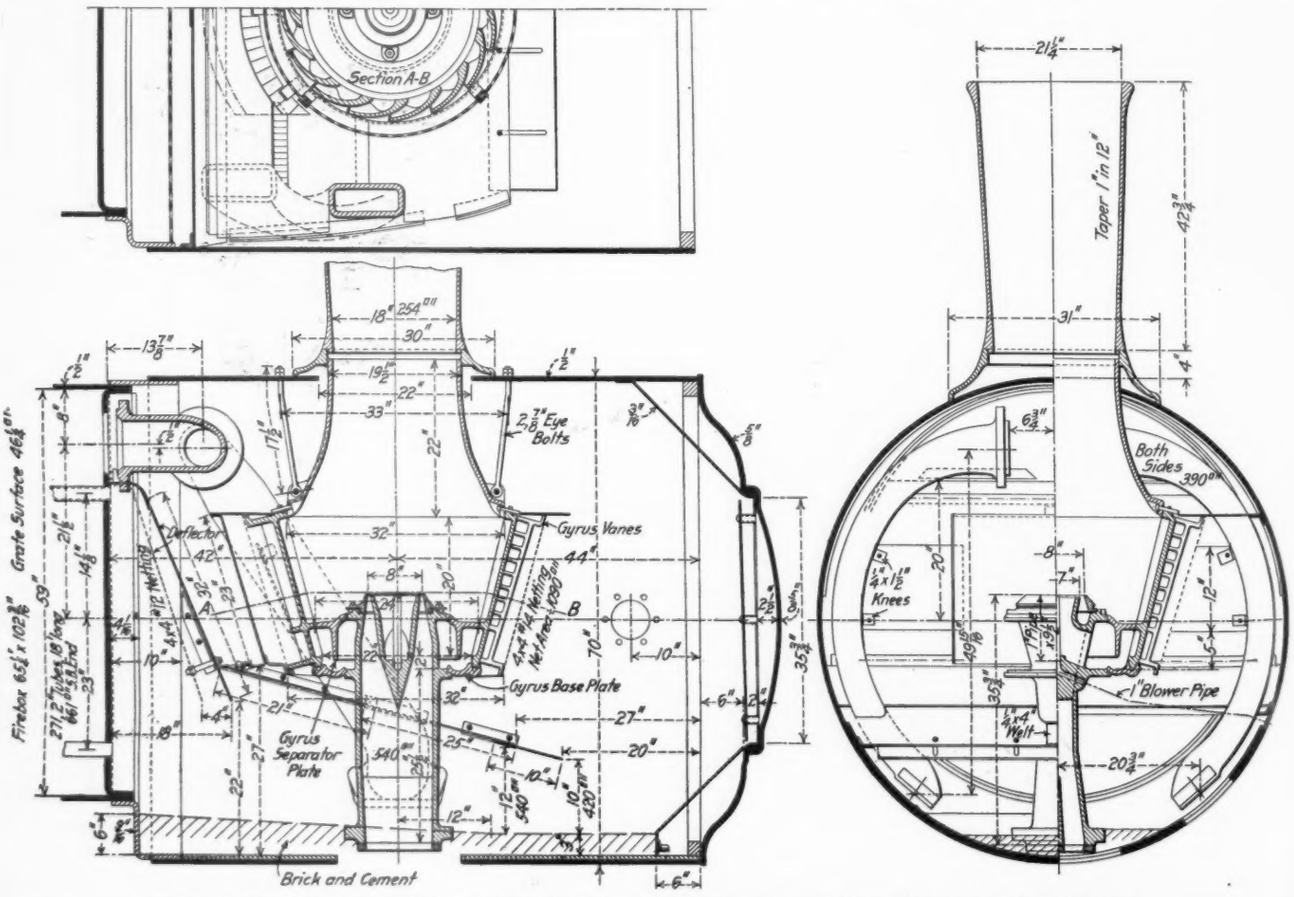


Details of the Gyrus Spark Arrester.

ered with No. 12 netting, which gives the sparks an initial abrasion, and a No. 14 netting surrounds the gyrus.

Fixed carbon	37.72
Volatile combustible	38.66
Ash	2.21
Moisture	21.41
	100.00
Sulphur	4.24

The fuel burned in these locomotives has the analysis shown above and costs about $2 per ton in the district west of Long Pine, Neb., on the Chicago & North Western.

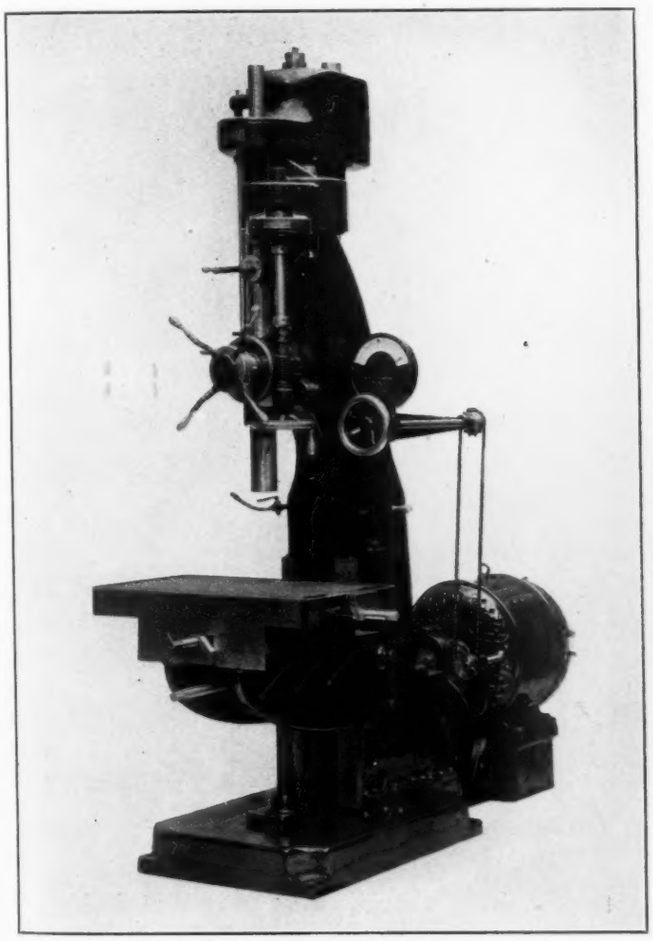


Gyrus Spark Arrester Applied to Smokebox of a Pacific Type Locomotive; Chicago & North Western.

RELIANCE SPEED DIAL

The continual trend toward more efficient methods in all machine tool operations has made it important to have some accurate method by which the machine tool operator can easily adjust his driving mechanism so as to give the prescribed speeds at the cutting tool under changing conditions of work. Where the speed changes are accomplished by means of cone pulleys or gears the spindle has a certain number of known, definite revolutions per minute, and it is a comparatively easy matter to embody in the blueprint for the work in question specific instructions showing the step of the cone pulley or gear combination at which each operation can be performed to give maximum efficiency.

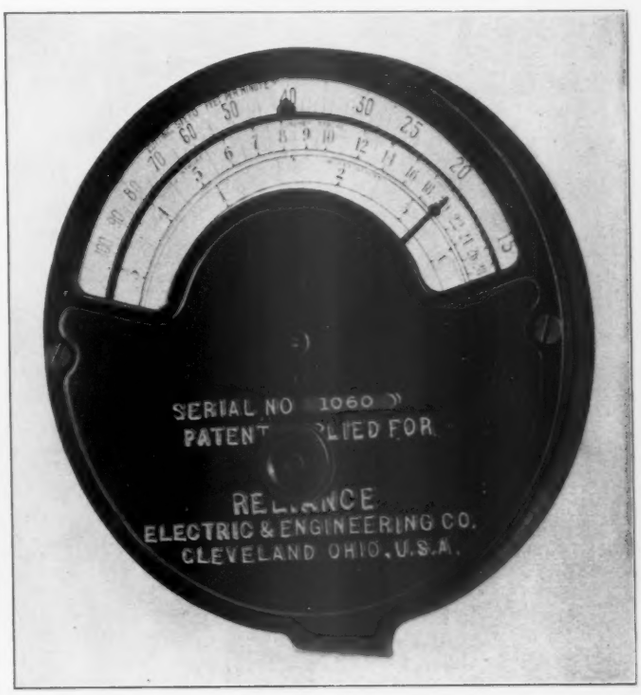
With the individual adjustable speed motor drive, however, the speed combinations are much greater in number, are not as easily calculated, and the proper speed setting is often a matter of considerable difficulty. In the case of the Reliance adjustable speed motor of the armature shifting type, an infinite number of speed changes can be obtained. As the armature is shifted there are no steps or jumps but a smooth, gradual, continuous change in speed, and on a machine tool driven by this type of motor, when it is necessary to make the approximations in speed setting required with other speed change devices, it is desirable for best results to give the operator some means of accurately adjusting the speed of the motor. A satisfactory device of this sort has now been developed by the manufacturers of this type of motor.



Foot-Burt Drill Fitted With a Reliance Speed Dial.

It is not a means of indicating the speed at which the motor is running, but is in reality an automatic calculator by which the operator can instantly set the speed of the motor so as to give any desired speed at the cutting tool, taking into account all the variable factors which would affect the problem. All the operator has to do is to set the dial for the cutting speed to be used and then shift the armature of the motor in the usual manner until the pointer indicates the diameter of the cut to be taken on the proper scale for the gear combination used. It can be mounted at any convenient point on the machine tool, and it is only necessary to have some positive connection with the means employed for shifting the armature of the motor. As the armature of the motor is shifted and the gradual change in speed is obtained, a pointer moves on the scale on the dial which takes into account the different gear ratios between the motor and the work, and can be set for different cutting speeds at the cutting tool, depending on the cutting speed used and the character of the work.

The dial not only serves as a guide in setting the speed accurately, but is always in plain sight as a definite indication to the foreman or inspector of the speeds in use by the operator. These dials can be furnished properly calibrated for use with Reliance adjustable speed motors on shapers, drills, lathes, milling machines, boring mills or any other type of adjustable speed machine tool.



Reliance Speed Dial.

One of the illustrations shows a dial arranged for a crank shaper with one back gear. The upper scale, indicating the cutting speed, is stationary. The small indicator, standing at 40, is mounted on a revolving disc with the two lower scales. The lower scales, showing the length of stroke, are adjusted by means of a knurl on the front of the dial until the indicator points to the cutting speed desired. The scales are not shifted unless a new cutting speed is to be used. With the scales set for any cutting speed, the motor armature is then shifted by turning the hand wheel illustrated in the other illustration until the pointer of the dial which is geared to the hand wheel rod is opposite the stroke to be used. The dial illustrated is set for 40 ft. a minute, with the motor speed adjusted for a 20 in. stroke with the back gear in. The bottom scale shows the stroke with the back gear out.

This device is manufactured by the Reliance Electric and Engineering Company, Cleveland, Ohio.

REPAIRING BELL RINGERS

BY J. A. JESSON
Louisville & Nashville, Corbin, Ky.

Although the construction and design of the automatic bell ringer is simple, the cylinders often become worn out of round. Under such conditions the renewing of the packing rings will not be sufficient to obtain the best results, or to prevent a waste of the air. In such cases it is necessary to rebore the cylinder. The accompanying illustrations show a tool for this purpose and a rack for testing out the ringing device. Fig. 1 shows a 2 in. adjustable blade hand reamer in position for reboring the bell ringer cylinder. The long shank furnished with the reamer is discarded and a short shank grooved so as to allow the double ended wrench *A* to be keyed on is used. A specially long collar *B* is used in place of the ordinary short collar and lock nut. This is made long so as to close in the blades when removing the tool from the cylinder when it reaches the bottom.

A 25/64 in. hole is drilled through the center of the reamer body in which the ⅜ in. bolt, having a head ⅛ in. thick and large enough in diameter to lap over the end faces of the reamer

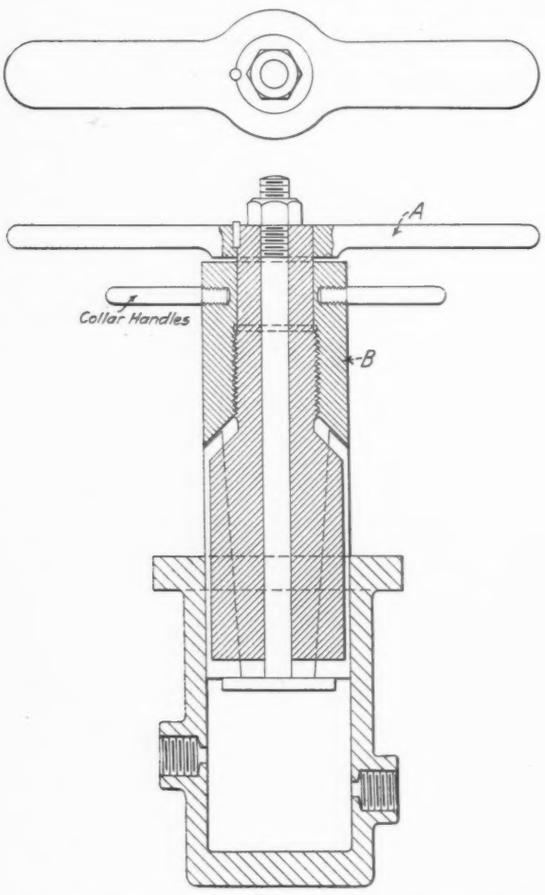


Fig. 1—Hand Reamer for Boring Bell Ringer Cylinders.

blades, is fitted and held in place by a nut at the top. After putting the reamer into the cylinder the collar *B* is slacked off and the inside bolt is tightened, forcing the tapered blades upward and outward until they bear on the sides of the cylinder; the reamer is then driven to the bottom and removed by loosening the nut on the ⅜ in. bolt and screwing the collar down, thus forcing the blades downward and reducing the diameter of the reamer. The blades should be ground to about the same cutting clearance as an end mill.

A testing rack for testing out the cylinder is shown attached to a post in Fig. 2. The frame *A* may be made of an old coupler yoke and a ball *B*, such as an old safety valve weight, may be used for the bell. This is fastened to a flattened part of the

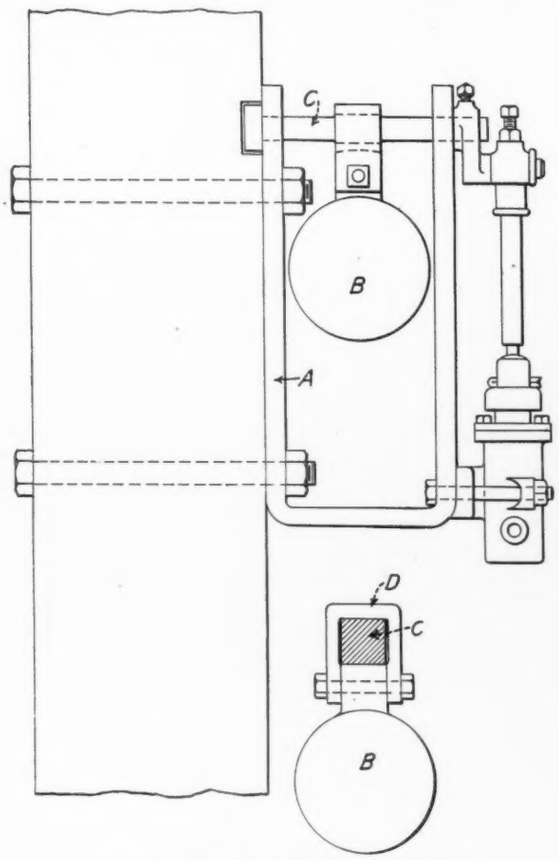


Fig. 2—Rack for Testing Bell Ringers.

shaft *C* by a U-clamp *D*. This device has proved very serviceable. The ball should be heavy enough to answer the purpose of a bell.

REMOVING LARGE CYLINDER HEADS

On large locomotives it is quite a problem to handle the front cylinder heads when they have to be removed and replaced in the engine house. A method for doing this in use on one of the western roads, which is simple and does not require a second man, is as follows: Remove the top cylinder head stud and screw in its place a round piece of iron of about the same diameter as the stud and of sufficient length to reach out to the bumper beam. The end is blocked up level at the bumper beam. When the nuts are all removed, the head is slid along the rod to the bumper beam and is out of the way until it is ready to be put back. In this manner one man can very easily handle the largest size head rapidly and without danger of jamming the threads on the studs or the joint on the head.

Scottish Motive Power Official Honored.—John F. McIntosh, locomotive, carriage and wagon superintendent of the Caledonian Railway, has been made a member of the Victorian Order by King George V and has the distinction of being the first railway officer to have his services so recognized. It is customary in the British Isles for some responsible railway officer to travel on the locomotive of the royal train, and on a recent occasion Mr. McIntosh rode on the locomotive which drew the King's special from the Highlands to London. When the train stopped at Perth the King went to the locomotive and personally conferred the M. V. O. upon the locomotive superintendent.

MACHINE SHOP KINKS

Awarded the Second Prize in the Shop Kink Competition which Closed September 15, 1911. The Kinks were not All Originated in the Shop with which the Author is Connected but were Collected from Different Places.

BY H. L. BURRHUS.

BRAKE FOR LATHE.

A simple arrangement for stopping a lathe is shown in Fig. 1. It is made from an old piece of leather belting which is fastened loosely around the back gear shaft so that it may be easily moved from one cone of the pulley to another and not interfere

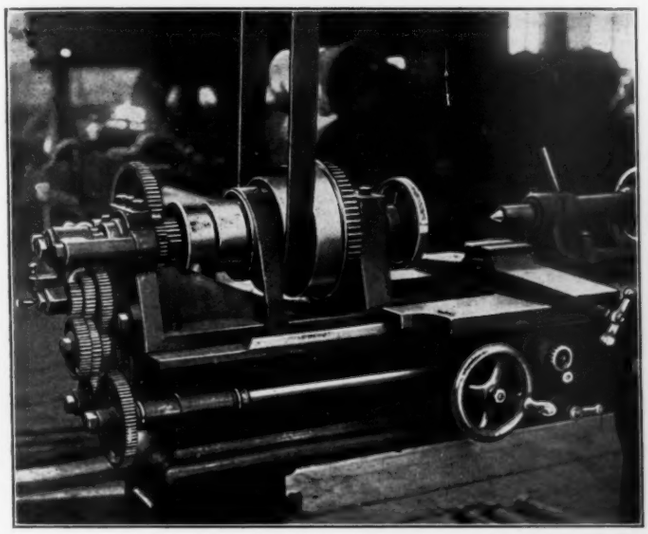


Fig. 1—Brake on Lathe Headstock.

with the driving belt. When the lathe is running the brake does not interfere in any way with the working of the machine. To stop the lathe quickly after the power has been shut off, simply pull down on the strap as it hangs over the cone. A very little weight on the end of the strap will stop the lathe in a

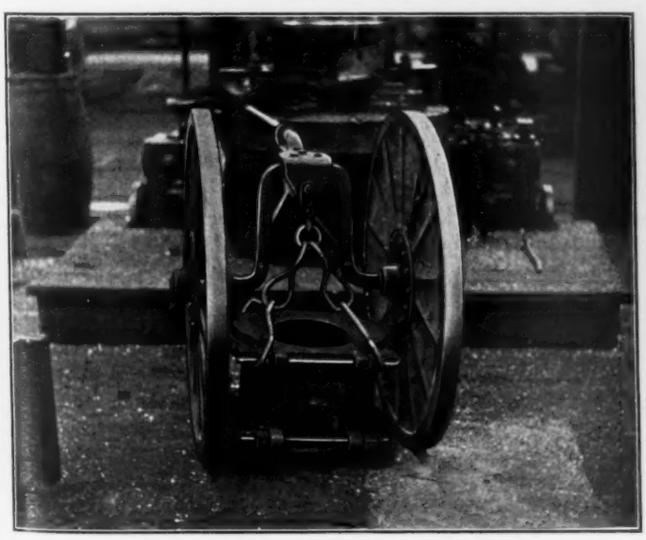


Fig. 2—Truck for Handling Driving Boxes.

few revolutions. Observations made in a large shop on high speed lathes showed that 10 per cent. of the workman's time was wasted while waiting for the machine to stop after the power had been shut off. After this brake was installed the workman's output was materially increased. It does not in any way cause unusual wear of the bearing.

DRIVING BOX TRUCK.

The truck shown in Fig. 2 is used for conveying driving boxes in and about the shop. The box is carried by the two hooks suspended from the center of the inverted U-axle. The axle is made of hammered steel, 1¾ in. square, and is bent so that the top of the inverted U is 34 in. from the floor. The rings and hooks are made of ¾-in. round iron and may be shaped to suit any style of driving box flange. The wheels are 36 in. in diameter and have tires 1½ in. wide. When it is desired to load the truck the handle is raised, so that the top of the axle will dip forward and allow the hooks to be slipped under the flanges of the box. A sheet iron cover is fastened to the spokes on the inside of the wheel, so that the box will not catch in them when it is being moved. Only one man is required to handle and transport the box with this truck.

RELIEF VALVE TESTING MACHINE.

An apparatus for giving relief valves and all other valves of a similar nature a hydraulic test of 200 lbs. pressure per sq.

Fig. 3—Device for Testing Relief Valves.

in., by using a shop air pressure of 90 lbs., is shown in Fig. 3. It is made from an old 14-in. brake cylinder, which has a smaller cylinder 6 in. in diameter screwed into the top head. A piston rod connects the large piston to a smaller one in the top cylinder, which forces the water into the valve to be tested. By opening a three-way cock, so as to let air into the underside of the large cylinder, the piston is forced up and will compress the water in the small cylinder to a high pressure, which may be regulated by the amount of air applied. A cap is fitted

to the top of the small cylinder so that connections of different sizes may be screwed in to suit the different valves. After the valve has been tested the three-way valve is reversed, allowing the air to escape from under the large piston and turning the air in on top so as to force the piston down.

MOLD FOR METALLIC PACKING RINGS.

An arrangement for molding metallic packing rings is shown in Figs. 4 and 5. With this mold all three rings may be poured at the same time and after the metal has cooled the cores, or

Fig. 4—Packing Ring Mold Ready for Pouring.

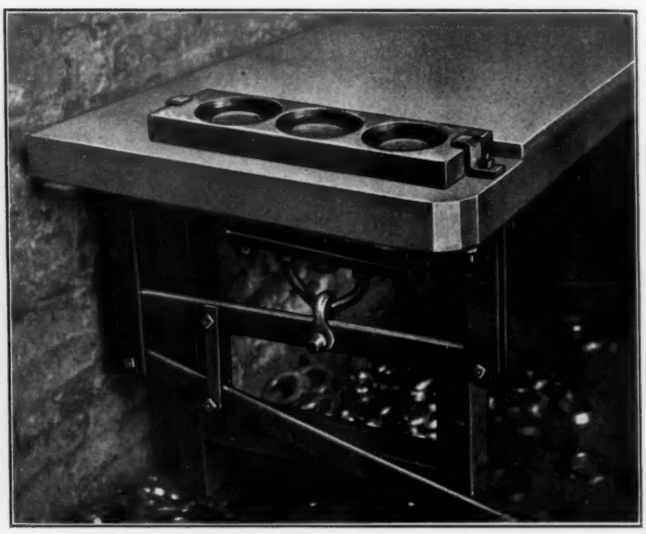


Fig. 5—Packing Ring Mold with Arbors Withdrawn.

arbors, are pulled down by a foot lever, allowing the rings to be easily removed. Fig. 4 shows the arbors in position ready to receive the metal, and Fig. 5 shows them withdrawn. By having different sized molds and arbors this same arrangement could be used for all sizes of packing. Each arbor is held in place by a coil spring, which rests on a sheet iron plate bolted to the underside of the bench. The bench shown in the illustrations is 3 in. thick, which allows for a coil spring of ¼ in. wire having a free height of 4 in. The springs are strong enough to force the arbors back in position as quickly as the foot is removed from the lever. This arrangement is much cheaper than compressed air.

DIES FOR FORGING SIDE ROD JAWS.

The dies for forging the fork or clevis end of side rods under a steam hammer so as not to require any machine work for finishing is shown in Fig. 6. The forging is done under a 3,000-lb. steam hammer, and from six to eight ends can be forged complete in 10 hours by one gang. As machine work on this job costs approximately $5 an end, this method means a saving of nearly that amount for every end forged. To forge an end the piece is first worked to the shape shown at *A*. The piece is

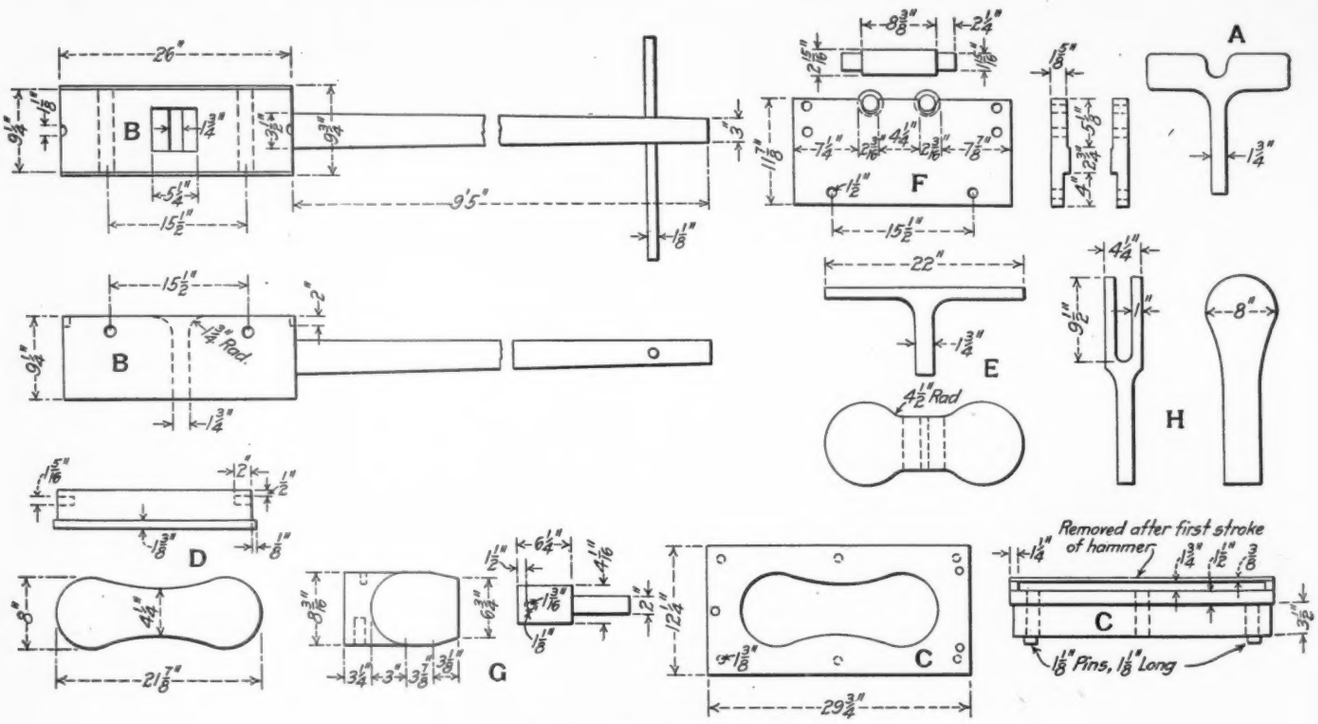


Fig. 6—Dies for Forging Side Rod Jaws.

then placed on the die *B* and the sides or wings are hammered to the proper thickness, after which the piece is placed on the dies shown at *C*, and is punched by the die *D* to the shape shown at *E*. The two ends are then bent to a U-shape in a bending box made with the two pieces *F*, which are fastened to the die *B* by 1½-in. bolts. Two rolls are placed in the grooves, as shown, and *E* is placed on them with the tail of the *T* extending down between them and into the hole in *B*. It is then forced down by the plunger *G* and takes the finished shape as shown at *H*. These ends can be forged about 18 in. long, so as to be easily welded to the rod.

TEMPLET FOR DRILLING ECCENTRICS.

The use of the jig shown in Fig. 7 for drilling holes in eccentrics greatly facilitates the operation, as it is not necessary to lay out the holes, and the drilling operation is also made easier. The holes for the set screws can easily be drilled accurately, and at the proper angle, which otherwise prove a difficult job. The jig is made so that it hooks over the lips on the large half of the eccentric and fits into the grooves on

Fig. 7—Template for Drilling Eccentrics.

the small half. The eccentric and the jig are clamped to an angle plate, and after the bolt holes are drilled it is easily set to the proper angle for drilling the set screw holes. The holes in the jig are larger than those to be drilled so that a hardened steel bushing or guide can be used. This also allows the same jig to be used for different size holes, the steel bushing being changed as desired.

DRILLING COMPOUND.

A drilling compound made of 5 bars of common soap, 10 lbs. of sal soda and about 50 gals. of water, and placed in barrels located at convenient points around the shop, is not only handy for the workmen, but is so much cheaper than oil that quite a saving is made by its use. By having it placed at different points, especially in large shops where some departments are quite a distance from the tool or supply room, no time is lost in getting a supply. This compound gives good service on the drill press or for air motor drilling and saves the oil, which costs approximately $20 a barrel.

GRINDING STEAM PIPE JOINTS.

Exceptionally good results are secured in grinding steam pipe joints or rings by using the dust or loose emery that collects around emery wheels. This dust contains enough steel and iron grindings so that being mixed with the loose emery it makes a combination that not only grinds quickly but also makes a good joint. It should be screened before using. It takes the place of emery or steel abrasive, costing from 4 to 15 cents per lb.

ELIMINATING ENGINE FAILURES

BY CHARLES MAIER.

The statement was made in Mr. Cordeal's article on engine failures in the January issue of the *American Engineer* that they can always be traced to errors or negligence on the part of individuals. To do this he carefully outlines a system of placing the responsibility of the failure and immediately locating it and imposing discipline or taking any other action necessary. He also states that the perfect engine kept in perfect repair cannot fail. These two statements represent the two extremes. One deals with the perfect engine while the other deals with the failure. In between these two extremes lies the practical part of the locomotive maintenance problem.

Unless some definite limit is set as to where the perfect engine ceases to be perfect, I do not think it is always fair to impose discipline, even though it may be due to apparent carelessness. An engine may be run in pooled or partially pooled service and make a big mileage and no one part show excessive wear. However, the general condition of the working parts may be such that a nut will jar loose, a pipe vibrate to the breaking point or a clean fracture of some kind be invited with the resulting engine failure. In tracing this failure it may be found that the part had been worked on, in which case the party doing the work is censured or disciplined. If no work was done to it, the inspector is considered responsible, and if he made no report it is up to him. Now, the idea of imposing discipline is to make men careful, so that the same mistake will not happen again. Where men are careful, but working under such conditions, the effect of discipline is demoralizing. Good mechanics will not work under such conditions, except through absolute necessity, and inspectors can only stay until they have been disciplined out of a job, or quit in disgust.

Another feature of this method, or, rather, lack of methtod, of engine maintenance is that work piles up and accumulates to such an extent that the engine house forces can hardly handle it, with the result that repairs are always made in such a hurried manner that the foreman cannot insist on a satisfactory standard of workmanship. Experience has shown the necessity of setting a limit of wear on certain parts, or of making periodical examinations of other parts. If this has been found necessary and has proved desirable in connection with certain parts of an engine it should be equally necessary and desirable as applied to the entire engine. After an engine has made a certain mileage the tires and flues may still be in excellent condition, but the valve motion, brake rigging, boiler pads, etc., may be worn so that an engineman or an inspector would not be justified in reporting any particular part, but they should all be completely overhauled. Unless a practice is made of taking an engine out of service after it has made a certain predetermined mileage and overhauling all working parts, putting them back in perfect condition, engine failures will continue to occur in spite of any discipline that may be imposed.

Some engines will wear out faster than others or some parts of them will wear out faster than the corresponding parts of others, but a fair average mileage can be determined where an engine should be considered as worn out. Where such a practice is established it should be strictly lived up to and all parts that are scheduled to be overhauled should be taken down, thoroughly cleaned, carefully examined for cracks, and put back in as perfect a condition as when the engine was new. This practice can be gradually inaugurated by starting in with engines that have recently had a thorough overhauling. Before the engine has made the full mileage allowed, preparations should be made to have repaired duplicate parts on hand and in this way the engine would only be out of service a comparatively short time. This practice, systematically followed out, will not cost any more for repairs per mile than the system of not doing the work until forced to by a failure, or by a threatened failure. While some

and perhaps considerable unnecessary work may be done, this will be more than made up by the saving effected by eliminating the numerous jobs that are worked at on each end of the division several times before a thorough repair job can be made. It will also tend to raise the standard of the regular running repair work, because the general condition of the engine will be better and less work will be required. The engines will always be in good condition and will not vary from very good to very bad.

It may be said that this should be a matter of judgment on the part of the foreman; that he should not allow an engine to become so run down that there is a liability of failure. This might hold true where all engines are taken care of at one repair point only, but it would not where engines from several divisions come to one roundhouse. What a foreman on one end of the division might consider as serviceable another might consider as worn out, and he would probably not be in a position to maintain all engines coming to his shop in the condition that he thought they should be. If he asked for an increase of force, a comparison would immediately be made with some other point handling the same number or more engines, and he would thus be compelled to as others did.

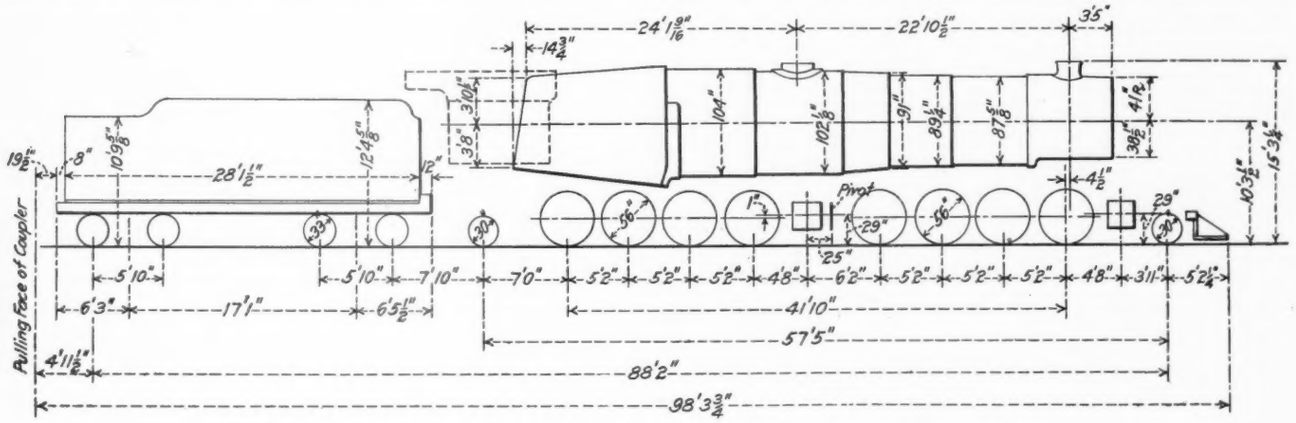
Where the maintenance of locomotives is systemized the work can be planned out ahead of time and be distributed so that it can be handled to the best advantage. Where it is not systemized the work comes in bunches and at times cannot be handled properly. The question arises as to what parts should receive the periodical overhauling. This depends on the class of engines handled and the service in which they are used. A study of engine failure records will also help to determine this.

During an experience of about 12 years as an engine house foreman, at points where engines in through and local passenger service were handled, I found that after an engine had made about 25,000 miles the valve motion, especially on engines equipped with the Stephenson gear, would be considerably worn and in a condition where it should be overhauled. The brake rods, hangers, pins and connections would be found to have considerable lost motion and the cotter pins would also be worn. Boiler pads at the frame connections would be worn so that the boiler worked on the frames. Babbitt-lined bearings in engine truck, trailer and tender truck boxes would be worn to a condition that justified their renewal. Air pipe clamps and reservoir fastenings needed attention. Engines equipped with piston valves should be examined and any shoulders on the bushings should be taken care of by renewing or boring them. Crossheads and rod brasses might be classed with regular running repair work, but if these were worn out at this time they should be refitted. The flues and some other parts of the engine may be found to need periodical attention more frequently and some of the parts mentioned may not need attention as frequently, but this can be readily adjusted to suit conditions. The main thing is to get the work systematized.

EXPERIMENTAL MALLET LOCOMOTIVE FOR THE PENNSYLVANIA

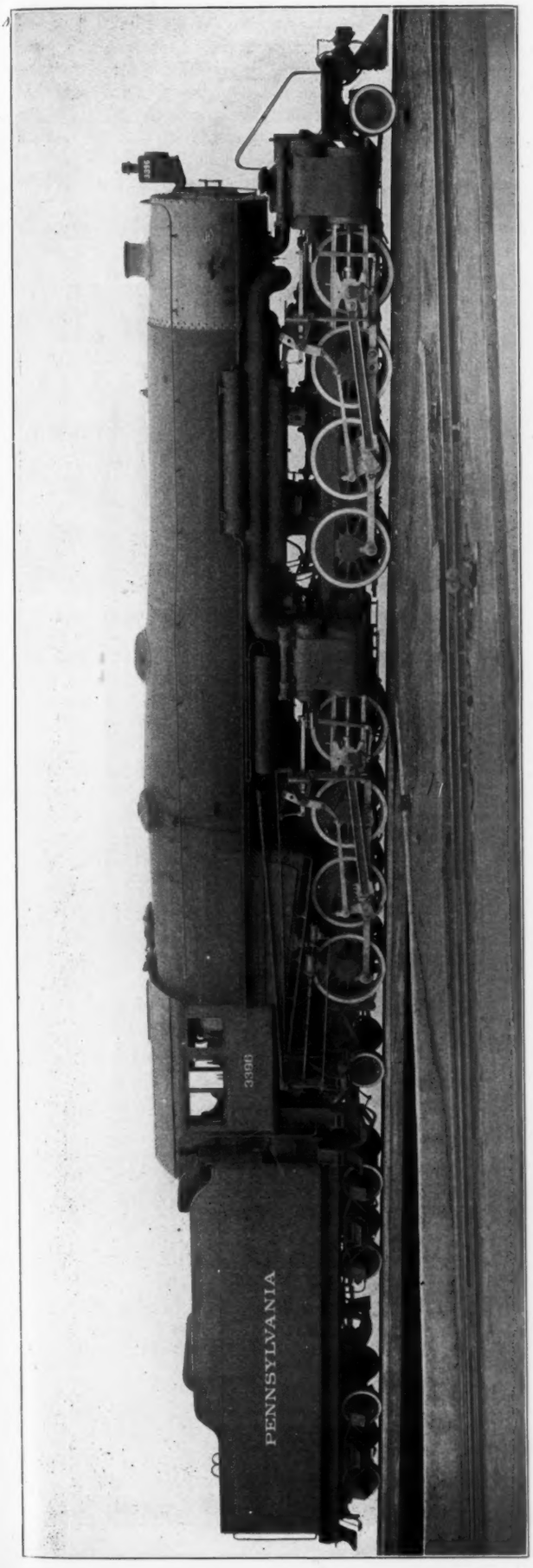
For the first time in this country a Mallet locomotive having four simple cylinders and using high-degree superheated steam has been built. The American Locomotive Company recently completed a single example of this kind for the Pennsylvania, and it is now in experimental service out of Altoona. The locomotive has the largest boiler ever built, and is equipped with a Schmidt superheater having 1,257 sq. ft. of superheating area. There are 282—2¼ in. tubes and 45—5½ in. tubes, 24 ft. 8⅞ in. long between tube sheets, which together with the firebox give an evaporative heating surface of 6121.1 sq. ft., and an equivalent heating surface of 8006.6 sq. ft.

It was desired to use a steam pressure of 160 lbs., and compound cylinders of sufficient size to develop the capacity of the boiler would make the low pressure cylinders too large to pass the clearance limits. Furthermore, by the use of high-degree superheated steam it was thought that there would be no loss in economy from the absence of the compounding, and therefore four simple cylinders, 27 in. x 28 in., were applied. This arrangement, of course, necessitates the carrying of a high pressure pipe from the superheater connection in the front end back to a swivel joint near the pivot pin and then forward to the cylinders on the front engine. This has been so carefully designed and constructed, however, that it is believed that no trouble will be experienced with leakage. Because of its experimental character comparatively little information concerning the details of the design is available at this time. The engine has a total weight in working order of 482,500 lbs., of which 437,500 lbs. is on the drivers. The theoretical tractive effort figured at 85 per cent. boiler pressure is 99,200 lbs. The general dimensions are given on the accompanying diagram.



General Arrangement of the Simple Articulated Locomotive for the Pennsylvania.

Field for American Equipment.—The cost of new railway construction in New Zealand could probably be considerably reduced if American labor-saving appliances were more largely used. In many instances neglect to use American tools and machinery for such work is due merely to neglect of American manufacturers in calling attention to the advantages of using them to save labor cost, which is very high in New Zealand. Unless, however, American firms arrange for some representation in New Zealand, preferably at Wellington, the capital, they can hardly expect to secure orders, as too much time would be required in correspondence. In case there is not enough promise of business to justify sending their own representatives out here it is best to arrange for some well-established local firm to take on an agency. When goods are indented for the New Zealand Government no duty has to be paid, although duty must be figured in case they are not indented directly, but are bought from local stocks.—*Daily Consular and Trade Report.*



Simple Mallet Articulated Locomotive with Superheated Steam; for the Pennsylvania.

GENERAL FOREMEN'S ASSOCIATION.*

BY W. M. T. GALE,
Shop Demonstrator, Chicago & North Western, Chicago, Ill.

I cannot conceive of any better medium for the interchange of practical experience along proper and well defined lines in engine house and shop practice; than by an interested participation in the conventions of this association. The progressive, up-to-date mechanic reads the best mechanical papers suitable to his particular needs, with resultant benefits to himself and employer. The railway shop foreman can also greatly improve his executive ability and mechanical education, and, incidentally, have an opportunity of conferring upon others the benefit of his practical experience through the medium of the General Foremen's Association.

The address of H. T. Bentley, assistant superintendent motive power and machinery, Chicago & North Western, at the recent convention was full of incentive and action. He brought the convention to its feet when he stated that the railway companies were amply repaid by the foremen's presence at the conventions. His statement that in order to be a live wire and a successful executive, it is necessary to read good mechanical papers, visit each other's shops, and keep in touch with the supplymen, was received with considerable approval by all present. The matters discussed at the convention covered plans of organization, methods of supervision, the economical handling of material, the multifarious and ingenious shop kinks and handy time saving devices, methods of handling locomotives in and out of shops and engine houses, the handling of material at shops and outlying points, the system of arriving at the cost of locomotive repairs, and the relation of officers to the subordinates. The efforts of general foremen along these lines should receive the approval and support of every railway official. The association should have the support and co-operation of all railway officials, for it is obvious, that its educational work is along up-to-date lines and that it must of a necessity inspire its membership to the standard of efficiency so much desired by the railways in general.

The opinion seems to prevail that some executive officers are more or less skeptical as to the value of these associations. It is a recognized fact that there is no organization so perfect that improvements cannot be introduced to advantage, and possibly the General Foremen's Association is no exception to the rule. The general foreman is the practical mechanic with a knowledge of economy in production, knowing the best and cheapest ways of utilizing the waste, and building up an efficient business organization. He has devoted a large portion of his own leisure time to his employer's interest. He cannot be called guilty of being a drone in his chosen calling; his devotion and skill is born of constant practice in the mechanical arts. He is an inventor of no small ability. Untiring effort is his keynote to success. He is a pioneer in initiative in railway shop management and, because of his practical experience, is familiar with the needs of the service. He is generally farsighted and a master of detail, and has an intelligent understanding of workmen. He knows their peculiarities and wants and understands how to get results from his men with the least effort. He is an expert in diplomacy and understands thoroughly how to handle men.

With men of this caliber as officers and members, participating in the active work of the association for the purpose of building up an organization whose principles and teachings are along lines of economical operation, there is no question as to the usefulness of its conventions and the practical advantages to be attained by attending them.

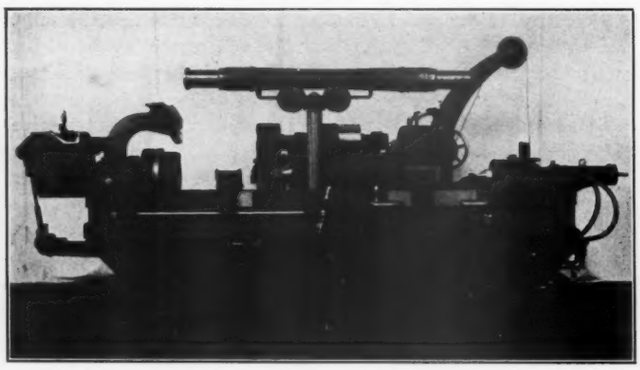
*Entered in the *Railway Age Gazette* competition on the Benefits of Convention Attendance, which closed October 15, 1911.

NORTON AXLE GRINDING MACHINE

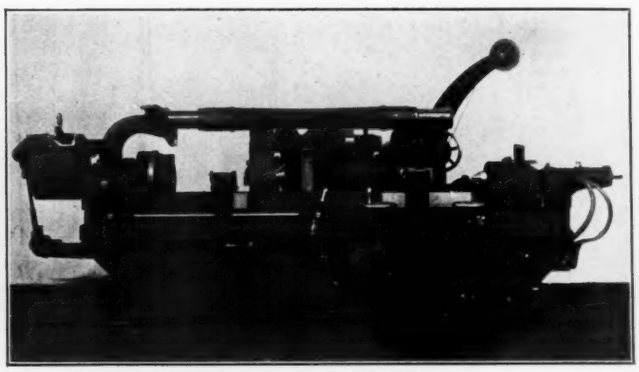
It has been evident that there could be a considerable saving made by grinding the journals and wheel fits of car axles if a grinding machine of suitable size and arrangement was available. In some cases axles have been placed in piston rod grinding machines, which are not at all suited for the purpose, but have given fairly satisfactory results with an occasional axle. When an axle is turned it is necessary to remove more metal than is required to just clean up the journal, and since there is comparatively small variation allowed in the size of journals this means that a considerable part of the life of the axle is lost without corresponding mileage. In grinding, on the contrary, there is absolutely no loss and in addition the trueness of the bearing is an attractive feature.

Recognizing the importance of this, the Norton Grinding Company, of Worcester, Mass., has now perfected a lathe designed expressly for grinding car axles. It is arranged for the most convenient and rapid handling of the axles and the maximum of accuracy in the work. The machine is remarkably heavy and rigid, weighing about 23,000 lbs., of which the weight of the grinding wheel with its revolving parts forms nearly one quarter. It is provided with a crane as part of the machine; also an air operated lift in the center and air operation of the tailstock. These labor-saving devices are so complete that after the axle is dropped into the saddles provided for the purpose, it does not require further handling by the operator. He has simply to turn on the air which lifts the axle to the centers of the machine; the driving mechanism, of the floating type, is then clamped on, allowing the axle to revolve on the two dead centers. The next operation is to clamp the tailstock and proceed to grind.

When the grinding is completed on one end of the axle the tailstock clamp is released; air is turned on, which first draws back the tailstock, automatically removing the axle from both centers. Then another air valve is opened and the axle is raised by the center plunger and is swung around on a ball-bearing pivot and dropped into place for grinding the other end.

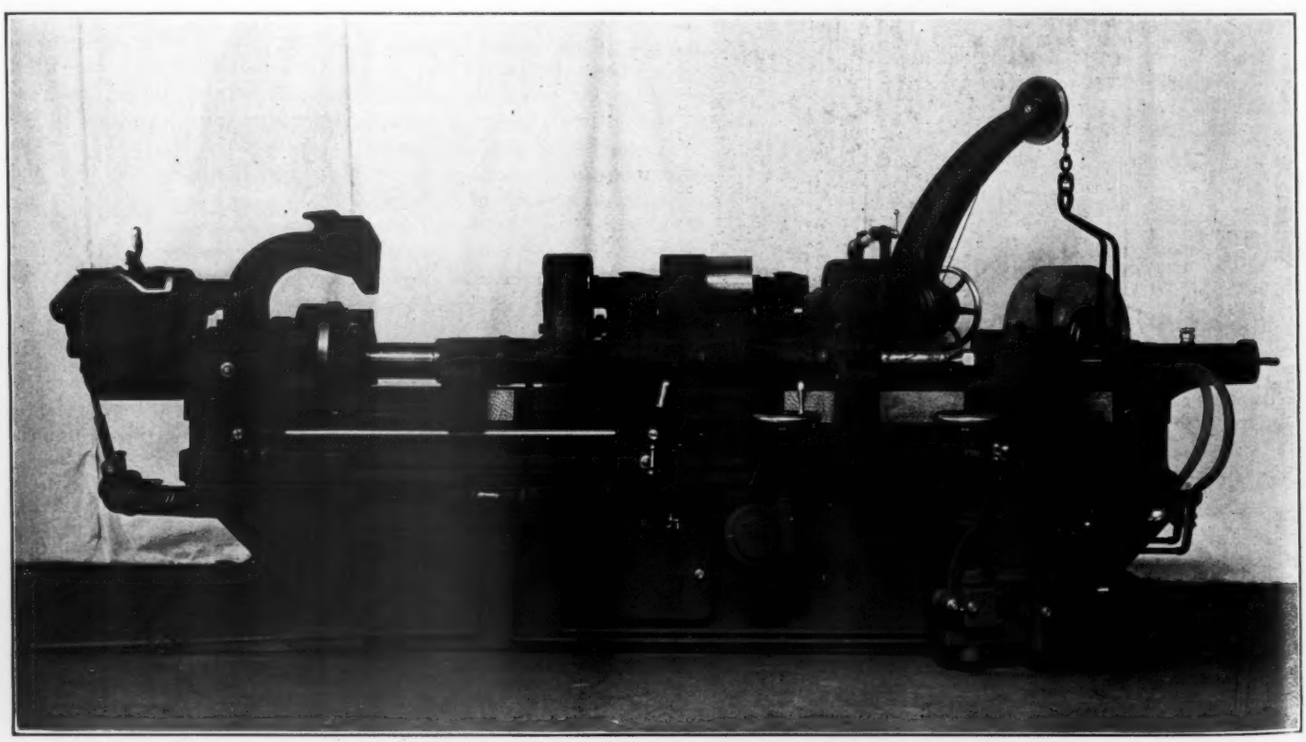


Axle Raised Preparatory to Reversing in Grinding Machine.



Axle Being Lowered in Grinding Machine After Reversal.

The machine is motor-driven, one motor supplying the power for all purposes. A pump is provided which delivers about 50 gals. of water or lubricant on the wheel and work per minute. This lubricant is contained in a tank forming part of the base of the machine. On the headstock is a gear box containing speed



Norton Axle Grinding Machine; Axle on Centers Ready for Grinding.

change gears; a lever for starting and stopping the work is conveniently located near the center of the machine. The driving gear, of the floating type, revolves on a roller bearing designed especially for this purpose, which is calculated to make the machine durable for the severe service and assures that there will be no wearing or wobbling of the driving gear under hard service. Other parts of the machine are designed with equal care to stand the maximum of misuse with a minimum of trouble. All revolving parts are of high grade steel and are heat treated where necessary. Ball bearings are liberally used throughout, and where worm gearing is used it runs in an oil bath.

To test the value of the different methods of finishing axles, so far as the accuracy of the work was concerned, three separate pieces were completed, one being turned and polished in the usual manner, the second being turned and roller burnished and the third being ground on this machine. Bronze rings, made with perfectly cylindrical bearings and exact fits on the test pieces, were rubbed parallel with the axles so that the bronze would slightly abrade the high spots. In this manner it was clearly shown that the first two specimens had a number of high and low places which were eccentric with each other and did not continue around the entire circumference. In other words, the film of oil between the box and a revolving journal finished in this way cannot be uniform throughout the entire revolution. The ground journal, on the contrary, showed an almost perfectly level surface, although it did not have the high polish of the other two. It is believed, however, that this grain on the surface will give a more perfect lubrication, particularly at the start. There seems to be little doubt but that the journal with the mirror finish but containing the high and low spots will not lubricate as well at the start as would a perfect cylinder with a grained surface.

The accompanying tables show the time and horsepower required for grinding the journals and wheel fits of seven different axles which have the reduction of diameter given. The letters refer to the two fillets, the journal and the wheel fit in order.

Since the demonstration from which these data were made there has been a considerable reduction in the time required for grinding and the manufacturers now state that an average production of three complete axles per hour can be guaranteed with this machine.

AVERAGE REDUCTION OF DIAMETER, IN INCHES, ON JOURNALS AND WHEEL FITS.

Axle No.	Left Hand End. Journal. Rough Diam.	Fin. Diam.	R'duct. Diam.	Wheel Fit. Rough Diam.	Fin. Diam.	R'duct. Diam.	Right Hand End. Journal. Rough Diam.	Fin. Diam.	R'duct. Diam.	Wheel Fit. Rough Diam.	Fin. Diam.	R'duct. Diam.
2.....	5.482	5.452	0.030	6.869	6.846	0.023	5.485	5.464	0.021	6.893	6.880	0.013
3.....	5.493	5.488	.005	7.013	7.004	.009	5.484	5.466	.018	7.015	7.005	.010
5.....	5.464	5.446	.018	6.815	6.798	.017	5.414	5.400	.014	6.815	6.797	.018
6.....	5.508	5.493	.015	7.021	7.000	.021	5.513	5.506	.007	7.020	7.009	.011
8.....	5.500	5.482	.018	7.008	6.994	.014	5.500	5.487	.013	7.011	6.987	.034
10.....	5.438	5.409	.029	6.922	6.900	.022	5.442	5.422	.020	6.943	6.926	.017
11.....	5.497	5.476	.021	7.007	6.990	.017	5.494	5.483	.011	7.012	7.001	.011

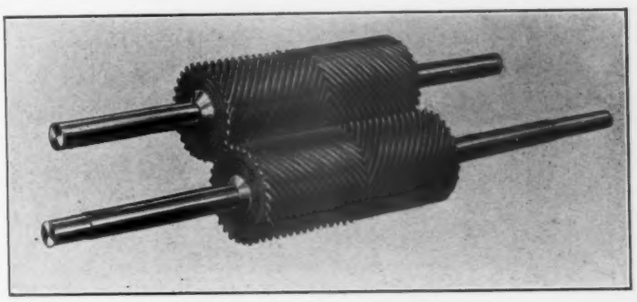
TIME REQUIRED FOR GRINDING THE VARIOUS ELEMENTS OF THE AXLE.

Axle number	2	3	5	6	8	10	11
Time	Min. Sec.	Min. Sec.	Min. Sec.	Min. Sec.	Min. Sec.	Min. Sec.	Min. Sec.
Putting in	7—20	1—12	.....	1—32	1—27	0—56	1—06
Grinding right hand end (A)	0—45	0—34	1—14	0—18	1—03	0—37	0—28
(B)	7—20	5—51	.....	2—58	7—51	6—22	4—09
(C)	1—45	1—30	2—22	0—42	1—34	1—55	1—08
(D)	3—00	2—51	5—44	2—12	4—15	1—46	2—42
Turning work on centers	1—25	1—48	1—32	1—25	1—17	0—48	1—22
Grinding left hand end (A)	1—45	0—37	1—14	0—44	1—04	0—56	0—49
(B)	7—15	3—30	8—02	5—07	7—58	8—05	5—53
(C)	3—05	0—57	1—58	0—58	1—07	2—18	1—28
(D)	4—00	2—14	3—52	3—11	4—03	2—56	3—32
Removing work from machine	1—40	1—04	1—16	0—59	1—03	1—12	1—12
Total time	33—25	22—08	27—14	20—16	32—42	27—41	23—49
Maximum horsepower	42.0	29.1	40.1	29.2	34.0	32.0	35.4
Average horsepower	17.1	11.9	16.3	11.5	17.1	13.5	12.75

Motor running light requires 3¼ horsepower.
Motor and machine running light require 6.44 horsepower.
Wheel, 24 in. diameter, 9 in. face; speed of wheel, 1,036 r.p.m.; surface cutting speed, 6,500 ft. per min.

A NEW TYPE OF STEAM TURBINE

A new type of steam turbine, called the Spiro, has recently been placed on the market by the Buffalo Forge Company, Buffalo, N. Y. This turbine was invented by John H. Van Deventer, superintendent of the Buffalo Forge Company, who has been developing and perfecting it for the past three years, and now the Buffalo Forge Company is making it as a commercial product. Although small in size it has a large range of power, the one illustrated herewith being rated at 185 h. p. At the present time, however, the commercial sizes range only from 1 to 50 h. p., non-condensing, but patterns are being completed to run these sizes up to 300 h. p.

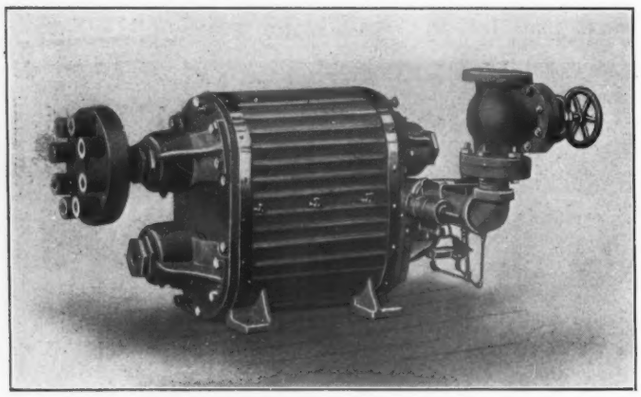


Rotors for Spiro Steam Turbine.

The construction of the turbine is very simple, it consisting of two rotors with herringbone teeth or value, the case of the turbine and the two heads which hold the rotors. The vanes of the rotors are cut from a solid cylindrical piece of steel with a special tool, which does away with all inserted vanes. The steam is applied at the center of the rotors at the apex of the vanes, being deflected so as to strike the vanes in the angle. The steam is pocketed between the vanes and casing, and as it expands, it drives the rotors. The force of the steam jet tends to give additional power and on that account the builders call it a "reaction and expansion turbine." However, no special provision is made to increase the velocity of the jet.

The maintenance of the whole outfit is slight, as the steam forms an elastic cushion between the vanes, which tends to decrease the wear. The leakage will be small between the

vanes, as the difference in pressure between them is small. The rotor bearings, being in the heads of the turbine, will need no extensive packing, as they are surrounded with the exhaust steam. The lubricating system of the bearings is so designed that each bearing acts as an individual oil pump, circulating the oil through the bearing between the shaft and the bushing with



Spiro Steam Turbine, Rated at 135 H. P.

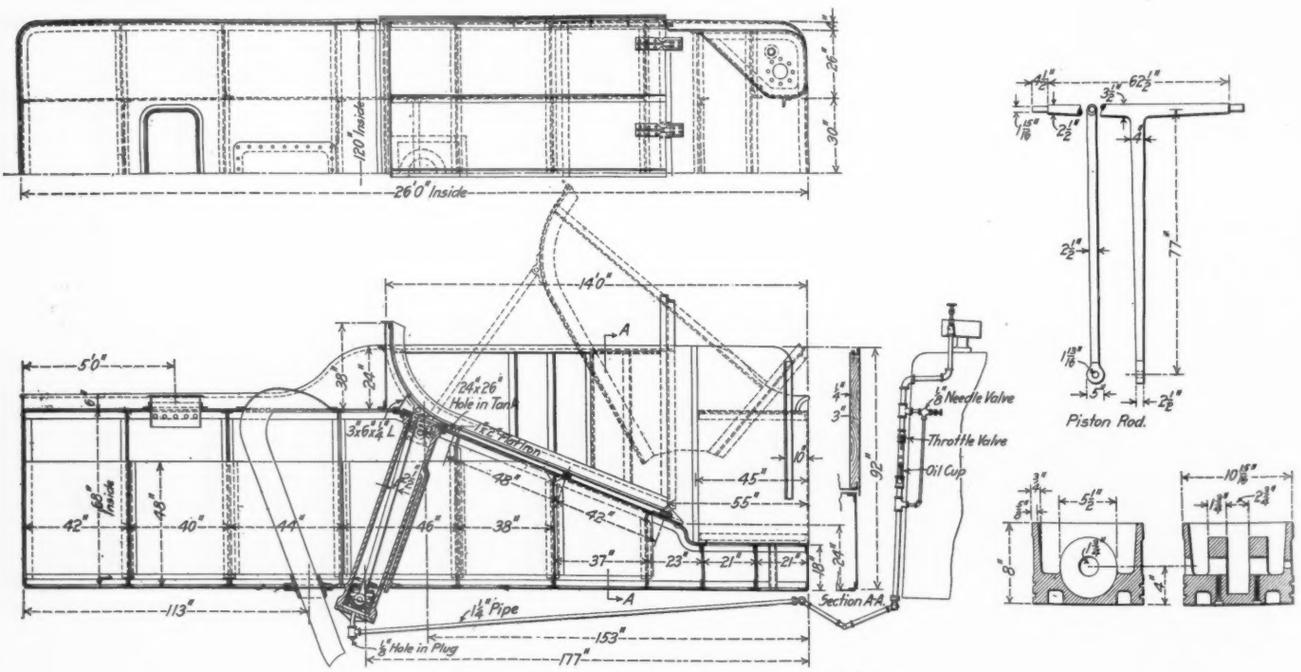
a positive pressure. In this way an oil film is maintained as long as there is any oil in the reservoirs.

Tests which have been made on this type of turbine show that with an initial pressure of 101.5 lbs., 25.3 h. p. was obtained at a speed of 2,450 r. p. m. The water used per brake horse power was 53.2 lbs. Another test, at an initial pressure of 115 lbs., showed 151 h. p. at a speed of 2,710 r. p. m., with a water consumption of 31.8 lbs. per brake horse power. Both of these tests were made non-condensing. The special uses for this turbine are the driving of fans and other similar machinery, for the larger sizes; and the operation of small hand drilling machines for the smaller sizes. The great power that is obtained from such a small machine is the chief advantage of this turbine.

COAL PUSHER FOR TENDERS

A considerable number of recently-built locomotives have been fitted with a mechanical arrangement for making the fuel supply more convenient for the fireman, as well as mixing the slack, which normally collects in the coal space of the tenders, with the fresh fuel. An outline drawing of this arrangement as applied to a Great Northern tender was given on page 427 of the November, 1911, issue of the *American Engineer & Railroad Journal*, and a more detailed illustration showing the dimensions and construction is given herewith.

The coal pusher here shown is attached to a tender which has a water capacity of 8,200 gals. and a coal capacity of 15 tons. The construction is simple, consisting of a supplementary hopper, hinged near the bottom of the slope sheet and fitting very closely into the coal space, which is raised by a piston in an 11 in. diameter cast steel cylinder placed in an inclined position through the water space. The steam supply is carried through a 1¼ in. pipe with a valve on the boiler head. The piston is provided with two small rings and there is a heavy coil spring placed around the piston rod above it to relieve the shock when it reaches the top of its stroke. The exhaust is provided for by a separate passage in the cylinder, the port being opened when the piston reaches nearly the top of the stroke, at which time all of the coal in the tender will be thrown forward, where it can be easily reached by the fireman. The hopper is made of ⅜ in. plate, stiffened and braced by angle irons and fits very closely into the coal space and practically does not reduce the carrying capacity of the tender at all. Wooden blocks are provided for taking up any wear on the sides or bottom, due to the operation of the apparatus. This coal pusher has been designed and is built by the Ryan-Johnson Company, 1747 Railway Exchange, Chicago, Ill., and is in use on the following railways: Great Northern, Chicago, Burlington & Quincy; Santa Fe, Chicago & North Western, Baltimore & Ohio, Duluth, Missabe & Northern and El Paso & South Western.



Ryan-Johnson Mechanical Coal Passer on Large Tender.

Plans have been made by the Southern Pacific for the electrification of one of its lines into Portland, Ore., as far south as McMinnville, at an estimated cost of $1,600,000.

The accident bulletin for July, August and September, 1911, shows that 201 persons were killed in train accidents and 4,283 were injured.

GENERAL NEWS SECTION

The engine house of the Missouri, Kansas & Texas at Hillsboro, Tex., was destroyed by fire on February 10.

The repair and machine shops of the Chicago, Burlington & Quincy at Creston, Ia., were destroyed by fire early in February.

The Pere Marquette has reduced the working time in its shops at St. Thomas, Saginaw, Grand Rapids and Ionia from six 9-hour days a week to five 8-hour days a week.

J. W. Cline, president of the International Association of Blacksmiths and Helpers, estimates that the strike last autumn on the Harriman Lines, exclusive of the Illinois Central, cost the men who struck about $9,000,000 in wages.

The Pennsylvania Railroad has recently granted the Pennsylvania State College the use of its old dynamometer car. This car was used by the Pennsylvania in establishing the tonnage ratings before it received its present dynamometer car; it originally cost $30,000.

A report issued by the Atchison, Topeka & Santa Fe, shows that in the six months ending January 31, 1912, during which the officers of the road have been conducting an active safety campaign, there were 36 employees killed and 3,608 injured, a decrease of ten killed and 447 injured, as compared with the corresponding period of the previous year.

A report compiled by the pension department of the Chicago, Rock Island & Pacific shows that $65,000 has been paid to employees in pensions since the pension system was established January 1, 1910. During this time 132 employees have been placed on the pension roll and of that number 16 have died. The ages of the pensioners range from 54 to 73 years.

The McGraw-Hill Book Company, New York, now has the exclusive sales agency for the technical books of the *American Engineer*, the *Railway Age Gazette*, and *The Signal Engineer*. This makes the McGraw-Hill Book Company publishers and distributors of books for the three journals, but it does not affect the publication of the papers themselves in any way.

The Atchison, Topeka & Santa Fe has made a change in its pension rules so that an employee who has been continuously in the service of the company for 15 years or more may receive a pension, if permanently incapacitated, without the necessity for showing that the disability was caused by employment in the service of the company, provided it has not been due to misconduct.

The Central of Georgia has established an educational bureau for the benefit of its employees, which is to be identical with that on the Union Pacific and the Illinois Central. D. C. Boy, a special representative of the educational system now in vogue on these roads mapped out the preliminary work incident to the organization of this new department, and will for the present have charge of the work on the Central of Georgia.

The committtee of the postoffice department and that of the mechanical officers of the railways having in charge the preparation of a uniform specification for steel postal cars, met in Washington, February 23. After a brief discussion the specification as previously prepared and printed in circular No. 26 of the Special Committee on Relations of Railway Operation to Legislation dated Chicago, November 16, 1911, was agreed to with some slight modifications.

The central safety committee of the Baltimore & Ohio is making a trip over the western lines of the system for the purpose of meeting the division safety committees and addressing meetings of employees on the importance of promoting safety in railway operation. The addresses are being made by C. W. Egan, chief claim agent, and W. L. Robinson, special inspector of the motive power department; and are accompanied by stereopticon pictures, illustrating conditions which often result in accidents.

A committee composed of thirteen general managers and vice-presidents has been appointed by the eastern railways to meet the representatives of the Brotherhood of Locomotive Engineers to discuss the requests for higher wages. This united method of meeting the situation is an important step; heretofore there has been no concerted action on the part of the eastern railways in meeting these labor problems. This lack of unity was severely felt in the adjustment of the wages of the conductors and trainmen in 1910 where there was a wide difference of wages between the different roads which was highly unsatisfactory to the roads paying the minimum rate. The committee has called on the roads concerned to prepare figures showing what would be the results of putting the proposed scale in effect. Roughly, it is estimated that the aggregate increase would be $10,000,000 a year. The percentages of increase vary from 15 to 50 per cent. in different classes of work. The meeting will take place in New York, March 14.

BALDWIN LOCOMOTIVE WORKS LOYAL LEGION.

The Baldwin Locomotive Works, Philadelphia, Pa., has instituted the B. L. W. Loyal Legion as a form of recognition of the loyal and faithful service of all its employees who continued in the active service of the company during the strike last June in spite of the extreme pressure that was brought to bear to make them become disloyal, including intimidation and personal violence. Each member has been given a solid gold button containing in the outer rim the words "B. L. W. Loyal Legion," and in the center, in gold figures on black enamel, the number of years of faithful service rendered by the recipient. The accompanying illustration shows this button, actual size. These tokens of appreciation and good will by the employer have been highly appreciated by those entitled to them and have served to create a certain rank based upon loyalty and service. The numbers are to be changed each year, as the center of the button is removable. The total force at work on February 13, 1912, was 8,543 men, and the number enrolled in the legion was 3,562, or 42 per cent. of the total force. This enrollment includes commercial and engineering officers and the technical staff, as well as the workmen employed in the shops. It comprises 2,055 men who have served faithfully and continuously for from one to 10 year; 936 men from 11 to 20 years; 390 men from 21 to 30 years; 132 men from 31 to 40 years, and 49 men from 41 to 50 years. There are 11 men who have been employed upwards of 50 years, the senior in point of employment being George Johnson, a traveling engineer, who has been continuously in the service of the company for 62 years, and is still at work. The percentage of the members of the legion to the total number of employees is, of course, subject to fluctuation, as the working force is continually changing. Men who enter the service of the company in the future will not be eligible to the legion unless a similar emergency should test their faithfulness and loyalty.

RESTORATION OF M. C. B. DEFECT CARDS.

A strong effort is being made by transportation officers throughout the country to bring about a restoration of the practice of applying M. C. B. defect cards at the time of the interchange of cars. At a meeting of the executive committee of the Chief Interchange Inspectors' and Car Foremen's Association

in Chicago on February 10, recommendations to the arbitration committee of the Master Car Builders' Association with respect to changes in the Master Car Builders' code of interchange rules were agreed upon, and in addition resolutions were passed heartily endorsing the undertaking of the American Association of Railroad Superintendents, working in conjunction with the Master Car Builders' Association and the Association of Transportation and Car Accounting Officers, to restore the M. C. B. rules.

The resolutions declare that the Master Car Builders' code represents a signed and binding contract entered into by the executive officers, and that the practice of applying M. C. B. defect cards at the time of interchange in accordance with M. C. B. rules is entirely practicable; and pledge the utmost support of the committee to the end that the M. C. B. code shall be restored at all interchange points. It was ordered that a copy of the resolutions be sent to each member of the association, "that their hearty co-operation may be secured in bringing about this much needed reform effective if possible on April 1, 1912, the date the carding practice becomes effective in Chicago and other important interchange centers."

The American Association of Railroad Superintendents through President E. H. DeGroot, Jr., has called a special meeting for the purpose of aiding in the restoration of the carding practice at as many interchange points throughout the United States as possible, effective on April 1, at the time the practice of carding cars in interchange will be instituted within the entire Chicago switching district. It is understood that many railway officers are desirous of having the plan adopted.

MEETINGS AND CONVENTIONS

New York Railroad Club.—Electric welding was the subject of an excellent paper by O. S. Beyer, Jr., presented at the February meeting. The paper was well illustrated and covered practically the same ground as the article by the same author which appeared on page 57 of the February issue of this journal.

International Safety Congress.—The honorary committee which will represent the United States at the International Safety Congress in Milan, Italy, May 27-31, will be composed of James McCrea, president of the Pennsylvania Railroad; E. A. S. Clarke, George B. Cortelyou, Philip T. Dodge, S. C. Dunham, Elbert H. Gary, chairman of the finance committee of the United States Steel Corporation; John Hayes Hammond, A. Barton Hepburn, Seth Low, Charles Nagel and James Speyer. Representatives of 38 various industries and other interests will serve on the national committee.

American Society for Testing Materials.—The committees of the society will report on the following subjects at the next convention which will be held in New York, March 28-29: Magnetic Testing of Iron and Steel, Tempering and Testing of Steel Springs and Standard Specifications for Spring Steel, Hardness Tests, Standard Specifications for Coal, Standard Specifications for Steel Standard Specifications for Wrought Iron, Standard Specifications for Cast Iron and Finished Castings, Standard Specifications for Cement, Standard Tests for Lubricants, and Standard Methods of Testing.

New England Railroad Club.—At the January meeting J. M. Fitzgerald, engineer maintenance of signals, New York Central and Hudson River, presented a paper on railway signaling. It consisted largely of a description of the latest general practice in signaling and pointed out the changes which are constantly being made toward greater uniformity throughout the whole country. He divided his subject into two parts, interlocking and block signaling, and discussed each separately, although it was stated that, with the extensive intsallation of track circuit control now being generally used, the two classes were gradually being combined.

Canadian Railway Club.—Locomotive boilers, their development and troubles, was the subject of the paper presented by J. W. Harkom, construction engineer, Melbourne, Que., at the February meeting. The author briefly traced the development of locomotive boilers from the beginning, pointing out the difficulties which had arisen, and how they had been corrected, and quickly bringing his subject up to present methods. Broken staybolts, leaky tubes and other detail features were discussed at some length and recommendations were made as to the best method of avoiding these troubles. Mr. Harkom advocated some new features of construction, one of the most novel being the use of a steel casting covering the whole surface of the back head of the firebox which requires staying. This casting would include the attachment for the stay rods and avoid the double plate generally used. The construction of Wood's boiler was briefly discussed.

International Railway Fuel Association.—The fourth annual meeting of the International Railway Fuel Association will be held at the Hotel Sherman, Chicago, on May 22-25. The program, as announced, includes the following papers: "Standard Locomotive Performance Sheet," by R. Collett, superintendent locomotive fuel service, Frisco Lines; "The Use of Anthracite for Locomotive Fuel," by T. S. Lloyd, formerly general superintendent motive power and equipment of the Delaware, Lackawanna & Western; "Drafting of Locomotives to Obtain Maximum Fuel Efficiency," by H. B. McFarland, engineer of tests, Atchison, Topeka & Santa Fe; "Proper Method of Firing Locomotives" (illustrated with motion pictures and colored slides), by D. C. Buell, chief of the educational bureaus, Union Pacific and Illinois Central; "Inspection of Fuel from the Standpoint of the Producer and Consumer," by J. E. Hitt and Glenn Warner, representing the Burnwell Coal Company and the Cincinnati, Hamilton & Dayton Railway, respectively; special paper by Prof. W. F. M. Goss, University of Illinois.

American Railway Tool Foremen's Association.—The annual convention of the American Railway Tool Foremen's Association will be held at Chicago, beginning July 9. Following is a list of the committees and of the topics which will be discussed:

Standardization of Steel for Small Tools. Henry Otto (A. T. & S. F.), chairman; W. J. Eddy (Erie), A. M. Roberts

RAILROAD CLUB MEETINGS

CLUB.	NEXT MEETING.	TITLE OF PAPER.	AUTHOR.	SECRETARY.	ADDRESS.
Canadian	Mar. 12	Technical Education and the Operating Department	Prof. H. O. Keay...	Jas. Powell.....	Room 13, Windsor Hotel, Montreal.
Central	Mar. 8	Committee Report on M. C. B. Rules of Interchange, and Paper on Safety Appliances and Injury to Employees.	W. O. Thompson....	H. D. Vought....	95 Liberty St., New York.
New England.....	Mar. 12	Man and the Railroad.....	Edward Hungerford..	Geo. H. Frazier..	10 Oliver St., Boston, Mass.
New York.....	Mar. 15	Annual Electrical Night.....	W. J. Harahan.....	H. D. Vought....	95 Liberty St., New York.
Northern	Apr. 6	.....	.....	C. L. Kennedy...	401 Superior St., Duluth, Minn.
Pittsburgh	Mar. 22	M. C. B. Rules of Interchange.....	R. S. Kleine, ch'man.	J. B. Anderson...	Union Station, Pittsburgh, Pa.
Richmond	Mar. 8	Mechanical Stoker	C. F. Street.....	F. O. Robinson...	C. & O. Ry., Richmond, Va.
S'th'n & S. West'n	Mar. 21	Has the Cast Iron Wheel Reached Its Limit?	.....	A. J. Merrill.....	218 Grant Bldg., Atlanta, Ga.
St. Louis.....	Apr. 12	How an Engineering Contractor Would Run a Railway.....	A. P. Greensfelder...	B. W. Frauenthal	Union Station, St. Louis, Mo.
Western	Mar. 18	.....	.....	Jos. W. Taylor...	390 Old Colony Bldg., Chicago, Ill.

(B. & L. E.), C. A. Cook (C. I. & L.), J. Martin (C. C. C. & St. L.), and A. Sterner (C. R. I. & P.).

Milling Cutters, Their Formation, Tempering, Etc. A. R. Davis (Ga. Cent.), chairman; Gust Gstoettner (C. M. & St. P.), W. A. Fairbairn (N. Y. C. & H. R.), J. A. Shaw (Cent. of N. J.), F. W. Lugger (C. C. C. & St. L.), and A. W. Meitz (P. M.).

Care of Shop Tools. J. W. Pike (C. R. I. & P.), chairman; H. I. Derby (A. T. & S. F.), O. H. Dallman (Pennsylvania), Thos. Grant (D. & H.), E. R. Purchase (B. & A.), and G. L. Linck (H. & T. C.).

Checking Systems. J. T. Fuhrman (G. N.), chairman; J. B. Hasty (A. T. & S. F.), Wm. Greilich (C. H. & D.), H. E. Blackburn (Erie), Gilbert Mitchell (Erie), and F. Peterson (C. & S.).

Treating Steel in Electric Furnaces. G. W. Jack (I. C.), chairman; B. Hendrickson (C. & N. W.), J. C. Breckenfeld (St. L. & S. F.), and C. A. Shaffer (I. C.).

Master Car and Locomotive Painters' Association.—The advisory and executive committee of the Master Car and Locomotive Painters' Association held its annual meeting in New York City, February 22, and decided on the following subjects for the next convention, which is to be held at the Albany Hotel, Denver, Colo., September 10, 11, 12 and 13, 1912: What is the most appropriate finish for the interior of vestibule ends? Specifications for standard paint materials for railway equipment. Treatment and care of steel passenger car roofs. Modern method of exterior passenger car painting, including primers and surfacers. Relative difference in cost of maintenance between steel and wooden passenger cars. The following subjects were also chosen for Essays: Qualifications of the present day foreman painter. Finish and treatment of passenger car concrete floors. The following Queries were also decided upon for discussion: What is the most economical process for removing old paint from locomotive jackets? Would you advise the use of interior car renovators, and why? What are the essentials of a protective paint making material? When natural finished ash, oak or mahogany have become stained or discolored by exposure to water or the weather can the stains be permanently bleached or removed without scraping the wood and how should it be done to obtain the best results. Would you advise painting a wooden roof of a freight car, considering its treatment after going into service?

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting of mechanical associations.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass. Convention, May 7-10, Richmond, Va.

AMERICAN RAILWAY MASTER MECHANICS' ASSOC.—J. W. Taylor, Old Colony building, Chicago. Convention, June 17-19, Atlantic City, N. J.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—M. H. Bray, N. Y., N. H. & H., New Haven, Conn. Convention, July 9, Chicago.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa. Annual convention, March 28-29, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago. Convention, May 22-25, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—L. H. Bryan, Brown Marx building, Birmingham, Ala. Convention, July 23-26, 1912.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio. Convention, August 15, Chicago.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York. Convention, May 14-17, Pittsburgh, Pa.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Convention, June 12-14, Atlantic City, N. J.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOC. OF U. S. AND CANADA.—A. P. Dane, B. & M., Reading, Mass. Convention, September 10-13, Denver, Col.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio. Convention, May 20-22, Buffalo, N. Y.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y., August, 1912.

PERSONALS

GENERAL.

J. KYLE has been appointed master mechanic of the Canadian Northern, with office at Edmonton, Alberta.

G. H. HEDGE has been appointed master mechanic of the Canadian Northern, with office at Winnipeg, Man.

A. SHIELDS has been appointed general master mechanic of the Canadian Northern, with office at Winnipeg, Man.

PETER VOSEN has been appointed assistant master mechanic of the Wabash at Decatur, Ill., succeeding E. O. Shively, transferred.

F. M. BAUMGARDNER has been appointed master mechanic of the Illinois Central, with headquarters at Clinton, Ill., succeeding L. E. Hassman, resigned.

E. P. HUGHES has been appointed traveling engineer on the Reid Newfoundland Company, covering the territory between St. Johns, N. B., and Clarenville.

E. W. BURGIS, master mechanic of the New Orleans Southern & Grand Isle at Algiers, La., has been appointed superintendent, with office at Algiers, succeeding J. S. Landry, deceased.

A. G. PASSMORE, division master mechanic of the Toledo & Ohio Central, at Kenton, Ohio, has been appointed division master mechanic, with headquarters at Bucyrus, vice J. T. Luscombe, resigned.

E. J. SEARLES, assistant to the general superintendent of motive power of the Baltimore & Ohio, has been promoted to superintendent of motive power at Pittsburgh, Pa., succeeding Mr. Carroll, promoted.

J. T. LUSCOMBE, division master mechanic of the Toledo & Ohio Central, at Bucyrus, Ohio, has been appointed master mechanic of the Cleveland, Cincinnati, Chicago & St. Louis, with office at Bellefontaine, Ohio.

J. E. GOULD, superintendent of motive power of the Norfolk Southern, with office at Berkeley, Va., has also been appointed superintendent of motive power of the Raleigh, Charlotte & Southern, a new line in North Carolina.

W. H. ERSKINE, assistant master mechanic of the Minneapolis & St. Louis, at Minneapolis, Minn., has been appointed division master mechanic with jurisdiction over the Central and Western division, with headquarters at the Cedar Lake shops, Minneapolis.

R. A. CROFTON has been appointed assistant general manager in charge of motive power of the Houston East & West Texas; the Houston & Texas Central; the Texas & New Orleans, and the Galveston, Harrisburg & San Antonio, with office at Houston, Tex., vice J. T. Connor, granted leave of absence.

G. T. HARTMAN, assistant superintendent of the Copper Range, at Houghton, Mich., will have jurisdiction over the mechanical and supply departments, and the present heads of these departments will report to him. Mr. Hartman is to continue to report to the general superintendent, and will devote his entire time to the above departments, relinquishing his present duties in train and station matters, etc.

O. S. BEYER, JR., an inspector on the Erie Railroad, and formerly on the personal staff of T. Rumney, mechanical superintendent, has accepted a similar position with Mr. Rumney on the Rock Island Lines. Mr. Beyer was graduated from the mechanical engineering department of Stevens Institute in 1907. He was a machinist apprentice and draftsman with the E. W. Bliss Company, Brooklyn, N. Y., and later was connected with the tire rolling department of the Midvale Steel Company at

Nicetown, Pa. In 1908 he went with the Erie Railroad at Jersey City as a special apprentice, and a few months later was detailed for special work in the office of the mechanical superintendent, Mr. Rumney, later receiving the title of inspector. While at Philadelphia Mr. Beyer attended the Wharton School of the University of Pennsylvania, taking an evening course in accounting, business law and finance. He was the author of the article on Standard Practice Cards on the Erie in the January, 1912, issue of the *American Engineer,* and of the article on Electric Welding in Railway Shops in the February issue.

C. K. Shelby, whose appointment as master mechanic of the Pennsylvania Railroad at Olean, N. Y., shops, was announced in the January issue of the *American Engineer,* was born on September 18, 1870, in Allegheny county, Pa., and after attending St. Paul's School, Concord, N. H., he was graduated from Lehigh University in 1892, with the degree of mechanical engineer. He entered the service of the Link Belt Engineering Company, and later went to the Baldwin Locomotive Works. In November, 1894, he became a special apprentice at the Altoona shops of the Pennsylvania Railroad, and was appointed assistant foreman of passenger car inspectors in February, 1899. One year later he was made assistant master mechanic at the Juniata shops, and in December, 1902, he was transferred in the same capacity to the Renova shops, and was acting master mechanic at those shops from May until June, 1903. Mr. Shelby was appointed assistant engineer of motive power of the Philadelphia & Erie Railroad division and of the Northern Central Railway in July, 1903, with office at Williamsport, Pa., and was made master mechanic of the Elmira division of the Northern Central in April, 1906, which position he held at the time of his recent appointment as master mechanic of the Buffalo division.

J. T. Carroll has been appointed assistant general superintendent of motive power of the Baltimore & Ohio, with office at Baltimore, Md. He was born on June 12, 1875, at Cassadaga, N. Y., and was graduated from Purdue University, Lafayette, Ind. Mr. Carroll entered the service of the Brooks Locomotive Works as draftsman in September, 1894, remaining with that company until January 1, 1896. He was then consecutively draftsman on the Erie, the Chicago, Rock Island & Pacific, and the Chicago & North Western. In August, 1899, he was appointed mechanical engineer of the New York, Chicago & St. Louis. In 1904 he went with the Lake Shore & Michigan Southern, where he filled various positions, including general foreman, assistant superintendent of shops, assistant master mechanic and master mechanic. He was appointed superintendent of motive power of the Baltimore & Ohio, with office at Pittsburgh, Pa., in 1910, which position he held at the time of his recent appointment as assistant general superintendent of motive power.

John T. Carroll.

Charles E. Gossett, whose appointment as general master mechanic of the Minneapolis & St. Louis, with office at Minneapolis, Minn., was announced in the February issue of the *American Engineer,* was born January 25, 1869, at Millerstown, Ky. He received a common school education and began railway work in 1887 with the Kansas City, Fort Scott & Gulf, now a part of the St. Louis & San Francisco. He subsequently served as machinist apprentice after which he became a locomotive fireman. In 1892 he was made a locomotive engineer and served in that capacity on the Hannibal & St. Joseph, now a part of the Chicago, Burlington & Quincy; on the Wabash; the Chicago & Alton; the Atchison, Topeka & Santa Fe, and the old Rock Island & Peoria, now a part of the Chicago, Rock Island & Pacific. In 1899 he was made traveling engineer of the Rock Island at Chickasha, Okla.; in March, 1905, he was promoted to master mechanic, with office at Eldon, Mo., and two years later was transferred to Kansas City. He later resigned to become master mechanic of the Iowa Central at Marshalltown, Iowa, and two years afterward was transferred to Minneapolis as master mechanic of the Minneapolis & St. Louis. On January 10, 1912, subsequent to the absorption of the Iowa Central by the Minneapolis & St. Louis, he was made general master mechanic of the entire line.

Edward S. FitzSimmons, whose appointment as mechanical superintendent of the Erie Railroad, with office at Cleveland, Ohio, was announced in the February issue of the *American Engineer,* was born in April, 1876, at Columbus, Ohio, and was educated at the high school and the night business school at Horton, Kan. He also took a correspondence school mechanical engineering course, and began railway work on August 6, 1890, with the Chicago, Rock Island & Pacific at Horton. He remained with that company until May, 1899, and then went to the Delaware, Lackawanna & Western as foreman boiler maker at Scranton, Pa. In February, 1904, he was sent by the same company to the Baldwin Locomotive Works as inspector of new equipment. Mr. FitzSimmons went to the New York, New Haven & Hartford in August, 1904, as general boiler inspector, with headquarters at New Haven, Conn., and in February of the following year was appointed general foreman boiler maker of the Erie, with office at Meadville, Pa. He was promoted to master mechanic of the Cincinnati division in August, 1907, with office at Galion, Ohio, and the following February was transferred in the same capacity to the Allegheny and Bradford Divisions, with office at Hornell, N. Y., which position he held at the time of his recent appointment as mechanical superintendent.

Edward S. FitzSimmons.

CAR DEPARTMENT.

C. E. Ferguson has been appointed foreman of the Grand Trunk Pacific at Rivers, Man.

V. B. Duncan has resigned as foreman of the coach department of the Trinity & Brazo Valley at Teague, Texas.

E. J. Wheeler has been appointed general car inspector of the Chicago, Burlington & Quincy Lines west, with headquarters at Lincoln, Neb., vice William Hanson, resigned.

Henry Marsh, general car foreman of the Minneapolis & St. Louis at Marshalltown, Iowa, has been appointed district car

foreman of the eastern division, with headquarters at Marshalltown. His former position has been abolished.

SHOP.

J. E. STEVENS has been appointed assistant foreman of the Mobile & Ohio at Meriden, Miss., vice W. M. Snyder assigned to other duties.

A. R. TEAGUE has been appointed general foreman of the Mobile & Ohio at Meriden, Miss., vice E. G. Brooks assigned to other duties.

A. J. ROBERTS has been appointed locomotive foreman of the Grand Trunk Pacific at Regina, Man., vice C. E. Brooks transferred to Wainwright.

W. H. WENKE has been promoted to day engine house foreman of the Chicago, Rock Island & Pacific at Cedar Rapids, Ia., vice J. A. Wilkinson, resigned.

LEE C. NEYER has been promoted to assistant day engine house foreman of the Chicago, Rock Island & Pacific at Cedar Rapids, Ia., vice W. H. Wenke, promoted.

H. M. HASS has been appointed apprentice instructor on the Eastern lines of the Canadian Pacific. He will also advise in the maintenance and operation of cars and locomotives.

G. W. BULL has been appointed apprentice instructor on the Eastern lines of the Canadian Pacific. He will also advise in the maintenance and operation of cars and locomotives.

F. L. JONES has been appointed apprentice instructor on the Eastern lines of the Canadian Pacific. He will also advise in the maintenance and operation of cars and locomotives.

CHARLES BOWERS, foreman of the Ashland, Wis., engine house of the Minneapolis, St. Paul & Sault Ste. Marie, has been promoted to engine house and shop foreman at Fon du Lac, Wis.

T. WINDLE, assistant master mechanic of the Minneapolis & St. Louis at Marshalltown, Iowa, has been appointed general foreman of the Marshalltown shops and his former position has been abolished.

CHARLES POWERS has been appointed locomotive inspector of the Canadian Pacific, with headquarters at Montreal, Can. He will co-operate with the master mechanics in the matter of standard shop practice and economical handling of engines.

PURCHASING AND STOREKEEPING.

RALPH P. MOORE has been appointed purchasing agent of the Duluth & Iron Range, with office at Duluth, Minn., succeeding Fred H. White, resigned to accept service with another company.

H. W. DAVIES, purchasing agent of the Norfolk & Southern, with office at Norfolk, Va., has also been appointed purchasing agent of the Raleigh, Charlotte & Southern, a new line in North Carolina.

FRED H. WHITE, purchasing agent of the Duluth & Iron Range at Duluth, Minn., has been appointed purchasing agent of the Duluth, Missabe & Northern, with headquarters at Duluth, succeeding Sanford F. McLeod, resigned to engage in other business.

RENEWING DRIVING BRASSES WITHOUT DROPPING WHEELS.—The method followed on the Chicago & North Western of holding the driving brass in the box by means of a wedge which permits the brass to be removed and re-applied without the assistance of a drop pit or crane was illustrated and described in the May issue of the *American Engineer & Railroad Journal*, page 188. The advantage of this method was recently shown when a switch engine came into the house at 8 a. m., had a main brass taken out and a new one fitted and applied and was returned to service at 1 p. m., with total labor cost of $3.10.

NEW SHOPS

ABILENE & SOUTHERN.—The engine house and machine shop, which were recently burned at Abilene, Texas, will be rebuilt. The new engine house will contain 4 stalls and the shop building will be 138 ft. long and 32 ft. wide. They will be of concrete construction.

ATCHISON, TOPEKA & SANTA FE.—The re-construction of the shops at Clovis, N. M., has begun.

ATLANTIC, OKEECHOBEE & GULF.—Car repair shops will be built at Fort Lauderdale, Fla., and at Garden City, a suburb of Tampa, Fla. Plans are now ready and the cost has not been decided upon.

BALTIMORE & OHIO.—New shops will be erected at South Cumberland, Md., which will cost between $300,000 and $400,000. It is expected that the work will commence on them in the Spring, although the plans have not yet been completed. This road has also purchased land at Garrett, Ind., for an engine house and shops.

BOSTON & MAINE.—Bids are being received for the erection of the shops to be built at Billerica, Mass.

CHICAGO, ROCK ISLAND & PACIFIC.—This road will build large shops at Hurlburt, Ark., near the terminus of the new bridge that crosses the Mississippi river at that place. It is also reported that $60,000 will be expended for improvements to the shops and engine house at Biddle, Ark.

DELAWARE & HUDSON.—A new engine house has been built at Binghamton, N. Y., and plans are being made for the installation of a small machine shop.

ILLINOIS CENTRAL.—It is reported that this road has purchased 700 acres of land at Meridian, Miss., as a site for shops to cost about $2,000,000.

LOUISVILLE & NASHVILLE.—Plans have been made to spend $200,000 on improvements to the shops and yards at Evansville, Ind.

MISSOURI, KANSAS & TEXAS.—It is reported that the construction of shops, engine house, turntable and a water-softening plant at East Waco, Tex., is about to begin.

NASHVILLE, CHATTANOOGA & ST. LOUIS.—It is reported that 35 acres of land have been purchased at Berclaire, Tenn., for an engine house, a machine shop and new yards. The property and improvements will cost about $100,000.

NEW ORLEANS, MOBILE & CHICAGO.—A new 12-stall engine house and an 80-ft. turntable will be built at Laurel, Miss. The company's force will do the erecting.

NEW YORK CENTRAL & HUDSON RIVER.—A contract has been let to the Lackawanna Bridge Company for the construction of a car shop at West Albany, N. Y.

NORFOLK & WESTERN.—An 85-ft. addition will be made to the erecting shop at Roanoke, W. Va., and traveling cranes will be installed.

NORTHERN PACIFIC.—This company will receive bids for a 37-stall engine house, a machine shop, car shop, supply house, coal bunker, ice house and storehouse for Parkwater, Wash.

PERE MARQUETTE.—This road is planning on building a large engine house at Ludington, Mich.

QUEEN & CRESCENT.—Plans have been completed for additions to the shops of this road at both Ludlow, Ky., and Somerset.

SOUTHERN PACIFIC.—The machine shops at Tucson, Ariz., will be rebuilt at a cost of $300,000.

UNION PACIFIC.—It is reported that the shops at Denver, Col., will be enlarged.

Supply Trade Notes

E. M. Richardson has been elected a director of the Chicago Pneumatic Tool Company, Chicago, to succeed Oliver Wrenn.

S. S. Knight has been elected vice-president and general manager of the Scullin-Gallagher Iron & Steel Company, St. Louis, Mo.

Thomas M. Gallagher, formerly a vice-president of the Scullin-Gallagher Iron & Steel Company, St. Louis, Mo., died at his home in St. Louis on February 1.

Prindle & Wright, counsellors-at-law, who have made a specialty of patent practice, have removed their offices to the Trinity building, 111 Broadway, New York.

Oscar R. Ford, general eastern manager of the Chicago Varnish Company, Chicago, with office in New York, died at his home in New York on February 8 at the age of 74.

Coleman B. Ross, formerly with the Linde Air Products Company, Buffalo, N. Y., has gone to the Independent Pneumatic Tool Company, Chicago, with office in Pittsburgh, Pa.

The office of E. A. Craig, southeastern manager of the Westinghouse Air Brake Company and the Westinghouse Traction Brake Company, has been moved from Wilmerding, Pa., to Pittsburgh.

The Independent Pneumatic Tool Company, Chicago, has secured larger floor space in the Farmers' Bank building, Chicago. The old office was at 1426, and the new office is located at Nos. 1208 and 1209.

Howard W. Evans, formerly general sales manager of the Crane Company, Chicago, has been made general sales manager of the Best Manufacturing Company, Pittsburgh, Pa., makers of pipes and pipe fittings.

L. A. Darling, formerly chief engineer of the R. G. Peters Manufacturing Company, Grand Rapids, Mich., has gone to the Remy Electric Company, Anderson, Ind., as engineer of the locomotive headlight department.

Taylor & Arnold, Ltd., Montreal, Can., has become the sole representative in Canada of the American electric headlight equipment for locomotives, a product manufactured by the Remy Electric Company, Anderson, Ind.

C. K. Lassiter, mechanical superintendent of the American Locomotive Company, has purchased a controlling interest in the Banshe Machine Tool Company, Springfield, Mass. Mr. Lassiter will not assume active control at present.

H. F. Wardwell has resigned as superintendent of power and equipment of the Chicago & Western Indiana and the Belt Railway of Chicago to become assistant manager of the Central Locomotive & Car Works, with office at Chicago.

The H. W. Johns-Manville Company, New York, has acquired the sole selling agency for the entire products of I. P. Frink, New York, manufacturer of Frink reflectors and fixtures, and is now in a position to design and sell lighting systems for all forms of artificial illumination.

The Locomotive Equipment Company, Detroit, Mich., has been incorporated with a capital of $350,000. This company will manufacture a new type of journal box and driving box, and a patented superheater for locomotives. Those interested in this company are Charles R. Richardson, Edward Smith and John A. Ott.

A. L. Whipple, for some years in the railway supply business, and for the last two years president and general manager of the Whipple Supply Company, New York, has resigned, and the company has been dissolved. Mr. Whipple will continue in the railway supply business with the Ward Equipment Company, New York.

J. Howard Mitchell, one of the founders of the William Butcher Steel Works, which was afterward the Midvale Steel Works, Nicetown, Pa., and senior member of the firm of Philip S. Justice & Company, Philadelphia, Pa., dealers in railway supplies, died on February 6 at his home at Hatboro, from a general breakdown, due to old age.

Frank F. Coggin, for several years representative of the Chicago Car Heating Company in New England territory, and who for the past six months has been connected with the Ward Equipment Company, New York, has returned to his former position with the Chicago Car Heating Company, with headquarters at 170 Broadway, New York.

The Western Steel Car & Foundry Company, Chicago, has purchased the plant and property of the Illinois Car & Equipment Company, occupying about 100 acres at Hegewisch, Ill. The company has occupied the property since 1902 under lease, and is now exercising its option to purchase.

At the annual meeting of the stockholders of the Niles Tool Works Company, Hamilton, Ohio, held January 30, the following officers were re-elected: James K. Cullen, president; George T. Reiss, vice-president; James L. Blair, secretary; Miles T. Watts, assistant secretary; Charles Cornell, treasurer, and Lucius B. Potter, assistant treasurer.

Charles Booth, who has been connected with the Chicago Pneumatic Tool Company, Chicago, since its organization, has been made district manager of the company's New England territory, with office in Boston, Mass., succeeding J. M. Towle, resigned. Mr. Booth was a vice-president of the company until September 1, 1911, when he resigned on account of ill health.

Edward Worcester, Jr., formerly district sales manager of the National Tube Company, Pittsburgh, Pa., at Atlanta, Ga., has been transferred to the St. Louis, Mo., office, vice Edward A. Downey, deceased. H. P. Nelson of the St. Louis, Mo., office has been transferred to the Atlanta, Ga., office. R. R. Lally, Jr., has been transferred from the Pittsburgh, Pa., office to the St. Louis, Mo., office, succeeding Mr. Nelson.

L. H. Mesker, who has heretofore been connected with the Cleveland, Ohio, branch of Manning, Maxwell & Moore, New York, has been appointed manager of the St. Louis, Mo., branch, with office in the Frisco building, succeeding C. L. Lyle, resigned. Frank P. Smith, who was formerly connected with the sales department, has again become associated with the railway department. C. L. McCullough, formerly connected with the Packard Motor Car Company, Detroit, Mich., has joined the sales organization, and will make his headquarters in Detroit.

The Eagan-Rogers Steel & Iron Company has been incorporated in Pennsylvania, with $100,000 capital. It has acquired a five acre tract on the Pennsylvania Railroad between Crum Lynne, Pa., and Eddystone, and is now erecting steel buildings, the contract for which has been let to the McClintic-Marshall Construction Company, Pittsburgh, Pa. The company will make light steel castings weighing up to 200 lbs., in addition to grey iron castings and other specialties. Steel made by the electric process will be furnished, as the company has obtained American rights for a successful process now in use in England. The principals are Daniel C. Eagan and John I. Rogers.

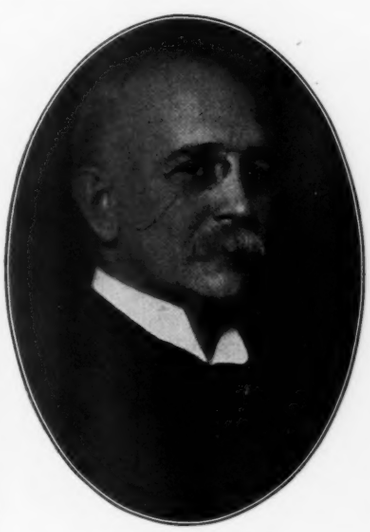
Charles B. Jenks, western sales manager of the Standard Coupler Company, New York, has been made sales manager for Edwin S. Woods & Company, Chicago. Mr. Jenks was for eight years employed in the traffic department of the Pennsylvania Railroad, and for six years was in the engineering and construction department of the Atlantic Refining Company, Philadelphia, Pa. In 1892 he went to the Pressed Steel Car Company, Pittsburgh, Pa., and for two years was in the operating department as assistant to the vice-president at Pittsburgh. For the next five years he was in the sales department at Chicago. In 1909 he

resigned to go to the Standard Coupler Company as western sales manager.

Charles Haines Williams, of the Chicago Railway Equipment Company, Chicago, was elected third vice-president of the company at its recent annual meeting. Mr. Williams was educated in the public schools of Baltimore, Md., and at the Baltimore Polytechnic Institute, from which he was graduated in 1893, and also took a special course in mechanical drawing and machine design at the Maryland Institute, and several private courses in different branches of engineering. He spent four years as special apprentice in the Mount Clare shops of the Baltimore & Ohio, working in the machine and locomotive shops, the erecting shops and in the foundry, drawing room and test departments. He left the Baltimore & Ohio to become connected with the Chicago Railway Equipment Company as mechanical inspector.

Charles Haines Williams.

Francis H. Stillman, president of The Watson-Stillman Company, New York, died suddenly on February 18 of intestinal hemorrhage at his home in Brooklyn, N. Y. Mr. Stillman was born in New York on February 20, 1850, and was graduated from the Sheffield Scientific School, Yale University, in the class of 1874. In 1883 he organized and became president of the firm of Watson & Stillman. The firm was incorporated in 1904 as The Watson Stillman Company, Mr. Stillman remaining its president up to the time of his death. He was a member of the Hanover Club of Brooklyn, the Engineers' Club, the American Society of Mechanical Engineers, and treasurer and, continuously throughout its existence, a director of the National Association of Manufacturers. He organized and was first president of the Machinery Club of New York, and was also first president of the National Metal Trades' Association. In addition to being president of The Watson-Stillman Company at the time of his death, he was also president of the Bridgeport Motor Company, Bridgeport, Conn., and of the Pequannock Commercial Company, and a director in other manufacturing firms.



Francis H. Stillman.

George A. Post, Jr., has been made western sales manager of the Standard Coupler Company, New York, with office in Chicago, succeeding Charles D. Jenks, resigned to engage in another business. Mr. Post was graduated from Cornell University with the degree of mechanical engineer in 1905. He began work in the Westinghouse Machine Company's works in Wilmerding, Pa., and was in its New York sales office for a year and a half, after which he entered the employ of the Standard Coupler Company in its sales department. Upon the organization of the Railway Business Association he was appointed assistant to the president, which position he held for two years; he has had personal charge of the business details of the dinners of that association. A year ago he returned to the service of the Standard Coupler Company as eastern sales manager.

William V. Kelley has resigned as president of the American Steel Foundries, an office he has held since 1905, and has been elected chairman of the company, a newly-created position, with office at Chicago. Charles Miller retains the position of chairman of the board of directors. Robert P. Lamont, who has been first vice-president of the company since 1905 was elected president in place of Mr. Kelley. Mr. Kelley's retirement as president was due to a desire to obtain relief from some of the responsibilities of active office in view of his extensive other interests. George H. Scott, second vice-president of the company, will be promoted to first vice-president, succeeding Mr. Lamont. R. H. Ripley, third vice-president, will be advanced to the second vice-presidency, and Warren J. Lynch, fourth vice-president, to the office of third vice-president. Mr. Kelley was born at Gratis, Ohio, February 13, 1861, received a high school and commercial education, and began his business career as clerk and bookkeeper in a hardware store at Springfield, Ohio, in 1883. From 1885 to 1888 he was sales agent of the Springfield Malleable Iron Company, and from 1888 to 1897 of the Charles Scott Spring Company, Philadelphia, Pa. In 1897 he organized the Simplex Railway Appliance Company, of which he became president and treasurer. In January, 1905, the stock of this company was sold to the American Steel Foundries, and in August Mr. Kelley was elected president of that company, holding the office until his recent election as chairman of the company. He is also a director of the Allis-Chalmers Company, the Continental and Commercial National Bank and the South Side Elevated Railroad, Chicago. Robert Patterson Lamont was born at Detroit, Mich., December 1, 1867, and was graduated from the University of

William V. Kelley.

Robert P. Lamont.

Michigan with the degrees of B. S. and C. E. in 1891. After leaving college he was employed at the World's Columbian Exposition in 1891 and 1892. From 1892 to 1897 he was secretary and engineer of Shailer & Schinglau, a contracting company. From 1897 to 1905 he was associated with Mr. Kelley as first vice-president and a director of the Simplex Railway Appliance Company, and in 1905, when Mr. Kelley became president, he was made first vice-president of the American Steel Foundries.

Plans are being made for a formal opening of the Permanent Manufacturers' Exhibit of Railway Supplies and Equipment in the Karpen building, 900 South Michigan boulevard, Chicago, during the week beginning March 16. Nearly 50,000 invitations will be sent out to railway and supply men, and admission tickets may be obtained from V. Courtright, secretary. The exhibit booths occupy 36,000 sq. ft. of space, or the entire twelfth floor of the building. A large assembly room and committee rooms, handsomely furnished, as well as a club room for the use of the exhibitors have been located on the eleventh floor. Invitations have been extended to a large number of railway associations to make use of the assembly and committee rooms free of charge for their meetings, and several organizations have the matter under consideration.

Samuel T. Fulton, western manager of the Railway Steel-Spring Company, New York, with office at Chicago, has been appointed general sales agent of the company, with office at New York, effective March 1. The greater part of Mr. Fulton's career has been in the railway service, and he enjoys a wide acquaintance among both railway and supply men. He was born January 11, 1866, at Topeka, Kan., and after being educated in the public schools entered the railway service July 1, 1879, as messenger in the telegraph office of the Kansas Pacific at Topeka. He was telegraph operator and agent at various stations on the Kansas Pacific and Union Pacific, and for two years was telegraph operator for the Western Union Telegraph Company at Topeka. In 1885 he became secretary to the superintendent of machinery of the Atchison, Topeka & Santa Fe; in 1888 secretary to the general superintendent at Chicago; in 1889 train despatcher of the Chesapeake & Ohio, and in 1890 he was made secretary to the freight traffic manager of the Cleveland, Cincinnati, Chicago & St. Louis. In 1891 he became stenographer to the chairman of the Central Traffic Association at Chicago; in 1892 secretary to the freight traffic manager of the Kansas City, Ft. Scott & Memphis; in 1893 chief clerk to the general superintendent; in 1895 chief clerk to the president and general manager, and in 1899 assistant to the president of that road. In August, 1901, he became chief clerk to the vice-president and general manager of the St. Louis & San Francisco at St. Louis, and from January, 1902, to February, 1903, was general manager of the Crowe Coal & Mining Company of Kansas City. In 1903 he returned to railway service as assistant to the vice-president of the St. Louis & San Francisco, and in April, 1904, was appointed assistant to the president of the Chicago, Rock Island & Pacific at Chicago.

Samuel T. Fulton.

CATALOGS

Drills.—The Cleveland Twist Drill Company, Cleveland, Ohio, has published an effective folder on Paragon Flatwist drills. The special feature of the folder is the reprint of an article on tests made with this drill at the M. M. and M. C. B. convention last June.

Friction Clutches.—The Carlyle Johnson Machine Company, Manchester, Conn., has published a booklet entitled The Johnson Friction Clutch as Applied in Machine Building. The booklet includes illustrations of various machine tools which have been equipped with these clutches.

Grinding Wheel Safety.—The Norton Company, Worcester, Mass., has published an interesting booklet entitled Safety as Applied to Grinding Wheels, describing and illustrating modern preventive and protective safeguards which may be easily applied in the use of grinding wheels and machines.

Locomotive Accessories.—The Locomotive Improvement Company, Clinton, Ohio, has issued catalog No. 2, describing Markel's removable driving box brasses, lateral motion plates, flangeless shoes and wedges and solid head main rods. The recent improvements in these articles are considered in the pamphlet.

Car Specialties.—The General Railway Supply Company, Chicago, has issued a 22-page pamphlet giving a general description and illustrations of various special devices used in passenger cars. They include metal sheathing, car insulation, vestibule trap doors, floor covering, curtain and window fixtures, and car roofing.

Automatic Starting Control.—The Reliance Electric & Engineering Company, Cleveland, Ohio, has published bulletin No. 7010 on automatic starting control, in which the advantages of this method as a power saver are pointed out. Illustrations include various machine tools which have been equipped with this device.

Draft Rigging.—The T. H. Symington Company, Baltimore, Md., has issued a new booklet illustrating and describing the Farlow draft rigging. The best method of assembling is illustrated and described for the benefit of car foremen and others interested in the proper application of the draft rigging to the car frame.

Chains.—The Morse Chain Company, Ithaca, N. Y., has published bulletin No. 11 on the Morse silent chain. This chain is described in detail and illustrated by photographs and diagrams. An interesting comparison between rope and chain drive is included. On the last page of the bulletin data is given to be used in the design of the Morse silent chain drive.

Turbo-Generator Sets.—The General Electric Company, Schenectady, N. Y., has published bulletin No. 4887 on Small Turbo-Generator Sets in capacities of from 5 to 300 k.w. All of these sets are of the horizontal type and may be arranged to operate either condensing or non-condensing and at any steam pressure above 80 lbs. for the smaller sizes and 100 lbs. for the larger.

Drills.—The Morse Twist Drill Company, New Bedford, Mass., has published a 350-page catalog, illustrating and giving the prices and dimensions of its twist drills, reamers, chucks, milling cutters, taps, machinists' tools, etc. A separate pamphlet published by this company illustrates and describes a new indexed case for drills from which the proper size drill can be quickly selected.

Electric Hoists.—The Sprague Electric Works (New York) of the General Electric Company has devoted a small illustrated booklet to the advantages and illustrations of the various types of Sprague electric hoists for handling loads which, on account of their location, are inaccessible to the ordinary traveling crane, or which are too small to be economically handled by such a large and expensive machine.